ZEALAND'S PERSONAL COMPUTER MAGAZINE

BITS & BYTES

October 1983 $1.25

16 bit computers — dream or reality

Computer intelligence

Bar coding

All our usual columns

Four computers reviewed

NEC APC
Casio FP 1000
Epson QX-10
and
National Panasonic's JR 100

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BITS & BYTES

October, 1983 Vol. 2, No. 2 ISSN 0111-9826

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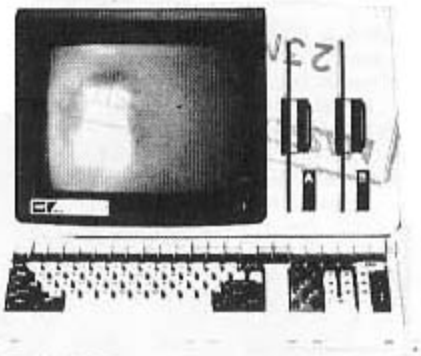

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EDITORIAL

A publisher, Mr D.J. Heap, of Auckland, in a letter to the editor raises some interesting questions about software and copyright, and the editor of *Bits & Bytes* comments.

Software and copyright

Dear Sir,

I was very interested in the September issue of your journal, particularly as several articles were devoted to educational software.

As a publisher of educational software developed in Britain we [Heinemann Publishers (NZ) Ltd] are as much in need of guidance as teachers are in this field, and the Department of Education hasn't done much to date to assist anyone.

However, I am always disturbed when I see a new development in education going down the same old track that all other developments over the past hundred years have followed. The article, "Towards compatability in school software," raises again the old spectre of copyright and the fact that it is a damned nuisance for teachers.

Curiously enough there is a much more realistic response to the same problem in an article later in this same edition on Page 35. I assume that the article is by Mike Wall as it is on the same page as the "Video Tape on Logo available" article.

In this, Mr Wall says: "The one thing that bothers me is that most schools have got used to the idea of software being free."

Teachers delude themselves if they believe that anyone is going to give away the enormous amount of time that is necessary to write professional courseware and software. I am not talking about the type of software which is quoted in one of your articles as taking 10 to 15 hours for a half-hour program. I am talking about the sort of software that takes anything up to 200 hours for the same length of program and is truly professional in its approach. Sure, there will be many teachers who will play around with software and who will develop highly usable material in the initial stages of installation of their computer. But given five years and the gloss will have gone off this exercise and people will be wanting other people to do the work.

If in fact software has not been copyright protected in that time who is going to bother producing more? And we assume there has got to be some development in this business. Please don't continue to promote the idea that anybody in this world is willing to do anything for nothing. It is idealistic and simplistic, and in the long run, shortsighted.

I know this letter will be written off as the "words of a commercial man" but believe me it is a realistic approach to the market-place and long term it is a realistic approach to the needs of teachers. Those teachers and specialists who have the expertise to write and develop good courseware and software need encouragement at every level. Financial encouragement is not the least of the attractions.

Yours sincerely,
D.J. Heap,
Managing Director
Heinemann Publishers (NZ), Ltd

Is enforcement possible?

Copyright in computing is a hot issue, in hardware and software. The chagrin of programmers and software firms and retailers is matched by a sense of challenge among many personal-computer users, and by funds-starved educationists seeking the best for their pupils.

As fast as traps and guards are built in they are beaten: we all know enthusiasts whose interest in copying a program is directly proportional to the software maker's attempts to guard it.

Copyright law originated in the days when it was a matter of licensing a printer to produce a work. Nowadays, photocopiers mean that virtually everyone has access to a printing press, as it were. This is also the case with microcomputers. But whereas photocopying must be done at the office, library, or local printshop, the micro user's copier is there on his desk, or in his house.

Enthusiasts have built up a thriving trade in swapping programs. Many users have one of the various picklock programs that circulate. Some have been offered to *Bits & Bytes*, for publication, and declined. There is even an underground industry in photocopying manuals

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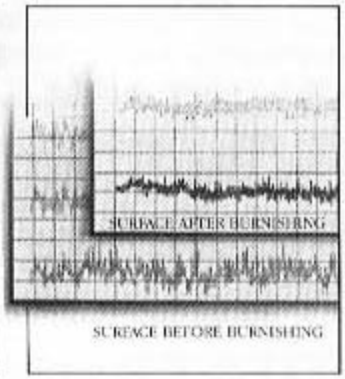

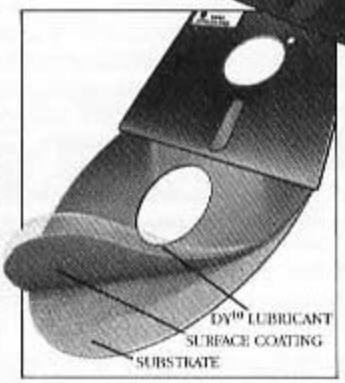

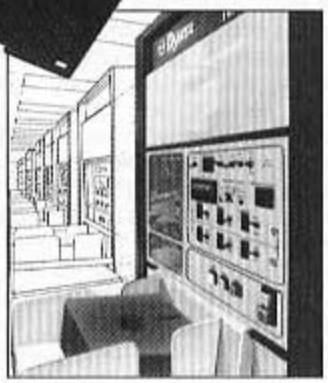

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EDITORIAL

for the pirated software.

Can legislation change this picture? Would New Zealanders tolerate inspectors' having access to offices or homes to check micro software? And how would these officials distinguish a legitimate back-up copy from a pirate copy? What of the right to re-sell property?

An official look is being taken at copyright in New Zealand (see the Micronews section in the September issue of *Bits & Bytes*.)

For micros, there are two sections of the problem.

In home software, the problem may well sort itself out. The growing amount of programs in the public domain will eventually give everyone a basic library. And as machines become more complicated, more complex programs, with more sophisticated complementary written material will be harder to pirate.

Pirated software remaining then (and we are talking of home copying, not industrial, large-scale pirating in foreign countries), may have a similar effect to that of public libraries. These have deprived authors and publishers of copyright income, by greatly increasing the number of readers per book. But have writers and publishers been losers because of libraries? Probably not, because libraries have greatly stimulated over-all reading. Borrowers are often also big spenders on books.

The second section of the problem, is piracy of educational software. This seems to be the chief area of Mr Heap's concern, and is more serious. It is as if the State were pirating copyright, by providing insufficient funds to allow teachers to make optimal use of hardware. Perhaps the State should make a special, central payment for approved software along the lines of the payment to New Zealand authors for books used in libraries. The State could also help by keeping duty off educational software, whether destined for home or school use: this should rank culturally with books, which are duty and tax free. And, the lower the price, the less likelihood of piracy.

— **Neill Birss**

READER SURVEY

Your chance to have a say in the future course of BITS & BYTES. Just take a few minutes to fill out the survey form that will appear in the November issue of BITS & BYTES.

MICRO NEWS

Apple v. Franklin

A Federal Appeals Court in Pennsylvania has reversed an earlier decision in the legal battle between Apple Computer and the smaller Philadelphia-based Franklin Computer Corporation.

Franklin had admitted to copying 14 Apple operating system programs in its micro, and had contended that these were not protected under American copyright law.

The Court has rejected this claim, thus clearing the way for Apple to seek an injunction barring Franklin from selling its Ace machine.

Perhaps the basic issue in the case was Franklin's contention that an operating system program embedded in hardware formed part of the basic computing machine and therefore could not be considered a literary work covered by copyright.

The Appeals Court said in its judgment that copyright protection was not "confined to literature in the nature of Hemingway's 'For Whom the Bell Tolls'."

A year ago, a lower Philadelphia court decided that the programs in the case had not been written in a language of description, rather than in binary code, and so were not eligible for copyright protection.

Franklin may still appeal to the American Supreme Court.

In the meantime the United States Congress is also considering new legislation that would protect the circuit designs of microprocessors.

The Appeals Court in its decision said that RAM chips should receive the same copyright protection as programs written on paper.

With the possibility of an appeal to a higher court, Franklin will probably be able to keep selling as at present, and if a final appeal were lost, the relevant programs should be able to be fairly easily replaced in any new machines.

Holiday camps

After attending the three Adventure Holidays, Ltd, computer camps, Hero 1, the robot, will be given to Northcote College, Auckland, in exchange for use of its computers, reports Peter Carr.

Each of the weekly camps held at Queen Victoria School, Parnell, was attended by 80 children. Primary and intermediate pupils attended the first two and secondary pupils the third. All participated in the making of a Super 80, Kitset computer purchased from Dick Smith Electronics. Pupils worked through BASIC programming at various levels. An optional graphics module was also offered.

Representatives of CED Distributors, Armstrong and Springhall, Singer and Steward, and Computer World gave talks about computing and vocational guidance was given by Carrington Technical Institute staff.

Episodes from the TV series, "The Mighty Micro", were shown with video movies. Mini golf, bumper boats, roller skating, kite making, swimming, photo orienteering, and sport in the gymnasium were also enjoyed.

One child extended his booking and attended all three camps and about 40 per cent indicated eagerness to attend the Christmas Camps between December 17 and January 16. Girls accounted for only 20 per cent of total attendance

New printer

A letter-quality, daisy-wheel printer, for under $1500 has been released in New Zealand by Brother Distributors (P.O. Box 2066, Christchurch).

The HR 15 retails for $1495, a price which includes both a centronics parallel interface and RS 232C serial interface allowing the printer to be connected to a large range of microcomputers.

The HR 15 prints at 15 characters per second (a 25 cps daisy wheel printer will also soon be available for about $2500) and tractor feed and sheetfeed attachments are available.

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B700 Series

Micro Business Systems, of Christchurch, will install the first Commodore B700 Series this month.

Smooth and rounded in appearance, the Series B700 Computer has detachable keyboard with separate calculator keypad and 10 special function keys. The 80 column x 25 line green phosphor screen can tilt and swivel.

Capable of addressing 896K of user RAM, it is available with either 128K or 256K as standard. It is configured in 64K banks with switching managed by the 6509 processor. An optional dual processor — the Z80 or 8088 — can operate concurrently with the standard 6509 enabling access to CP/M programs.

The standard 128K machine (processor, screen, keyboard) retails for $3695. The 8050 dual disk drives at $3295; the Commodore 8023 printer at $1995. The Adler typewriter with IEEE interface SE 8008 at $1995, and or Delux SE 1011 at $3095.

Conversions are being done on all existing standard accounting software packages for the Series B700.

Commodore B710

Strong book

Sales of Brian D. Strong's recent book, "Microcomputers in Plain English for New Zealanders", are going very well, with 2000 copies sold as at mid August. Obviously filling a gap in the computer book field, it is also on sale in Australia, South Africa and Britain, with Japan and the United States looking at it. At only $7.95 it must be an excellent investment for the newcomer to personal and small business computing. The book is reviewed in this issue of *Bits & Bytes*.

New company

A new company has been formed by the New Zealand Apple distributors CED to market two new computers in NZ. Computer Distributors Ltd (CDL) will cover the lower home computing market with the SpectraVideo, a US sourced 32k machine expected to retail at $899, or $719 education price. (This was announced in Micronews last month.) At the other end of the market, CDL will offer Morrow Multi-User computers, VisiCorp software and Rana disk drives.

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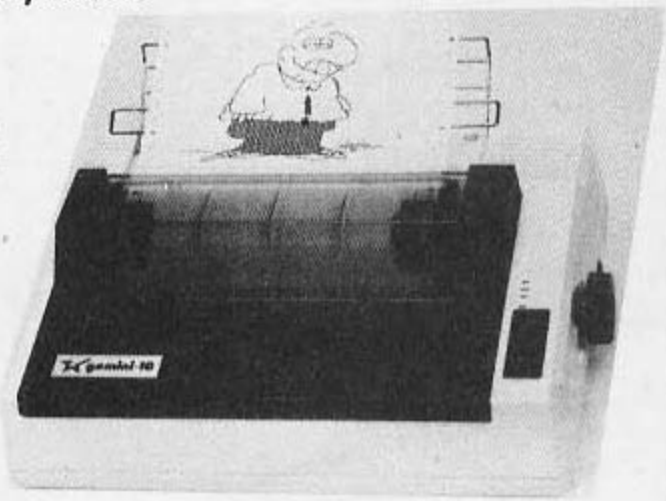

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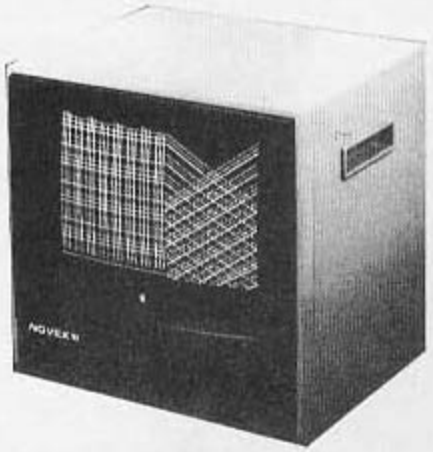

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UK prices tumble

With the release of the new XL Atari home computers in Britain the price of the popular 400 and 800 series is expected to drop substantially. The 400 is rumoured to be heading for the Spectrum price range (under $240). With a rumoured CP/M cartridge due for release the price should prove attractive. Meanwhile, Tandy is also soon to release a new colour home computer in the same price range.

Spectrum microdrives

Finally available for comment in Britain are Sinclair's microdrives. Spectrum users may be disappointed that the final product is a floppy tape drive (not a disk as the term 'microfloppy' might have suggested), although in every other respect the product appears good value at $120 for 100k storage. Any feelings on the drive are in any case compensated by the capabilities of the interface box (with RS232 port) and the availability of a crude but effective networking system. Be warned that the queue for all the new goodies is already a long one.

. . . and alternatives

If the microdrives are too crude, Technology Research of London, is marketing a Shugart-compatible disk interface for the Spectrum at $170. Lots of good storage but perhaps a big tail for a small dog?

Fifth utility, too

In an effort to be one up on Fourth, the useful language for graphics, the Spectrum now offers Fifth. However Fifth is not a language, simply a graphics-extension to Spectrum BASIC. It clearly offers some improvements to make graphics programming easier: a super Forth it ain't.

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NEC

Advanced Personal Computer

The NEC APC
Micro of Mercedes Class

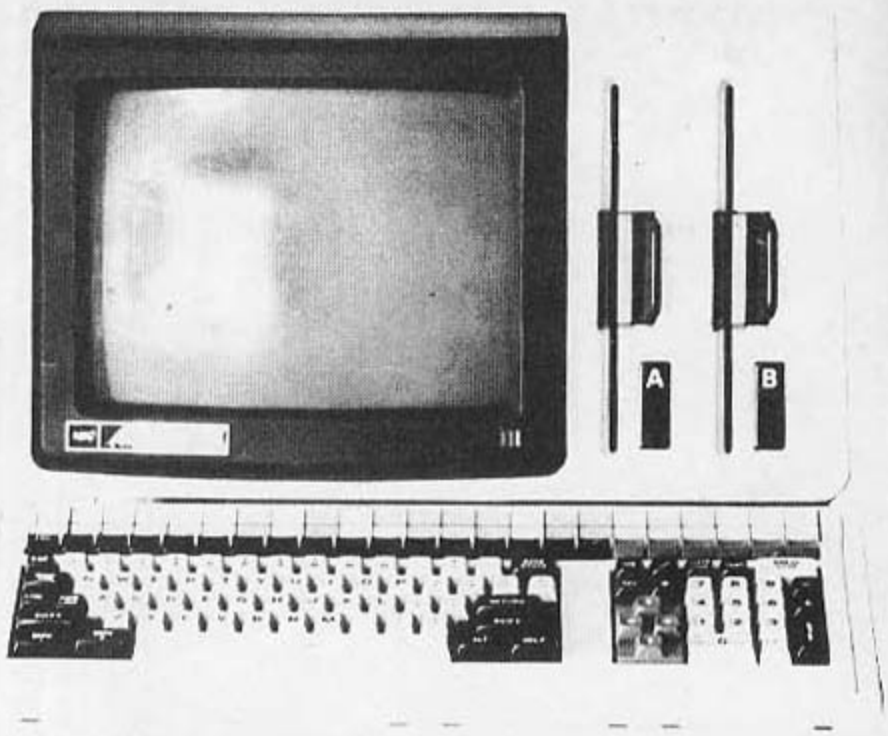
By PIP FORER

The Nippon Electronic Company's Advanced Personal Computer (the NEC APC) comes well recommended. Among its honours it was "Australian Personal Computer of the Year" in 1983. Knowing that the Australians have had the machine some time I had hopes to assess the APC some months ago. A little belatedly the APC is now here in full force and it certainly provides interest. It must be at the top end of the truly single-user (and thus personal) computer market with both features and a price tag that suggest this is currently (for all but the most affluent New Zealanders) a personal business machine rather than a personal domestic one.

Japanese computers have already gained a reputation for hardware quality at low cost. Their relatively low profile in world markets to date has been attributed more to weaknesses in the software side. We will look at both aspects here and concentrate on the features that make the NEC APC stand out from its rivals. There are, after all, a lot of 16-bit business machines that will run all the standard accounting packages, word processors, etc: why choose this one in particular? Unlike some 16-bit machines, it is not hard to find these unique features, although the price you pay may be higher than some. Among these features are the disk capacity and (with some additional modules) abnormally high-quality graphics for a general-purpose machine.

Hardware facts

The APC starts on the right foot for interest's sake by looking different from many of the desk top machines which employ 8088 or 8086 compatible processors. Where IBM's PC produced a bland, conservative product, NEC has made some unusual design decisions and earned a distinction for its product. For a start, the APC itself uses an NEC equivalent of the Intel 8086 processor, a true 16-bit processor. It runs at 5 MHz. The machine has a detachable keyboard but apart from that it sits in a single cabinet: no disk plinth and separate monitor. The cabinet contains integral, vertically mounted *8"* floppy disks and a *built-in* monitor. The *8"* disks are breakaways from the normal standard of 5¼", but repay the user with over 1 Megabyte per drive at double-density, double-sided or equally can operate in single-density, IBM 3740 compatible mode. They are fast, but rather noisy.



The NEC Advanced Personal Computer

The monitors, both colour and green screen, are of high quality. The colour one in particular is noteworthy with a very stable image and crisp coloration (although the green phosphor has rather long persistence). The whole is very neat, tidy and easy to install. I found the keyboard aesthetically less pleasing than some, but keyboards are a very personal taste. There are some useful special keys, including two to access alternative fonts, but the 22 special function keys could be grouped for easier identification.

The single-module appearance disguises the fact that the APC comes in significantly different configurations. The basic machine, which starts at $7388, comes with 128K of RAM, a single-disk drive, a Centronics and one RS-232 port, sound, and a green-screen monitor as standard. There are user-definable characters, special function keys and one or two nice features under battery power. These include a permanent clock/calendar (adding greater security to date stamping of files) and 4K of protectable CMOS RAM that can be left holding instructions or data while the machine is off or disconnected from the mains. There is also a nice scroll buffer which lets you look back through messages that have just been exited from the top of the screen. Some outdated advertising material states that the memory limit by expansion is 256K (from an address range of 1Mb). In fact, the APC now offers up to 640K RAM.

Strengths show in its options

Up to this point the hardware is very attractive if hardly earth-shattering. The APC begins to show extra strengths when the options start getting added. The fully configured APC with twin drives and colour graphics offers significant advances. Such a configuration will cost you over $14,000. For this you get 2Mb total disk storage, 256K RAM and a most unusual graphics system. The hardware of the graphics involves a high-quality monitor offering 640 by 475 pixels resolution (equivalent to 25 lines of 80 characters). This is driven from the hardware side by the widely praised NEC 7220 Graphics Display Controller chip. A greater surprise is that the 640 x 475 pixels are in fact

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4. Other computer languages such as LOGO, UCSD PASCAL, COMAL and ASSEMBLER are being developed. Existing VIC and 40 column PET BASIC programs can be easily converted.

5. The powerful sound chip gives 3 totally independent voices each with a range of 9 octaves. User control over music envelope, pitch and pulse shapes provides the ability to make your Commodore 64 sound like a variety of musical instruments, solo or in harmony.

6. 62 predefined graphic characters plus full alpha numerics with upper and lower case letters, all available directly from the keyboard and displayable in normal or reverse video in any of 16 colours.

7. 40 column by 25 lines colour display. In high resolution graphics mode, a bit mapped screen gives 320 x 200 individually addressable pixels.

8. The dedicated video chip allows the use of high resolution multi-coloured "Sprites" (moveable object blocks). Sprites can be moved pixel by pixel, independently of anything else in the screen.

9. Sprites can also be set up in 8 "layers" giving full 3 dimensional effects with, if required, automatic collision detection between sprites and any other screen object.

10. Machine bus port will accept ROM cartridges for many applications, including business, educational, home and leisure software.

11. A second processor option using the Z80 gives the Commodore 64 the ability to support CP/M.®

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H-Fi Output	YES
VIDEO OUTPUT	
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T.V. Output	YES
INPUT/OUTPUT FEATURES	
Cassette Port	YES
Intelligent Peripherals	YES
Serial Peripheral Bus	YES
ADDITIONAL SOFTWARE FEATURES	
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a window on to a 1024 x 1024 plotting area that is held in the computer's memory.

Even this has its imitators among some desk-top micros. The breakthrough comes in that with colour options you have eight colours freely available in that plotting area. The quality of the colour plotting available with this option is very high and the user can draw figures, colour fill them and pan across the wider graphics area via the hardware. Some idea of what is involved, however, in storing such a large colour display can be seen from the fact that the colour option contains its own 384K of RAM for screen storage. The necessity of at least high-capacity floppies becomes apparent for anyone wanting to save screen images with that degree of memory involved.

Over all, the hardware of the APC has some very useful features.

Standard Software

Most purchasers of small systems have a range of needs that can be initially met by variations on some standard software. What is available to make this impressive hardware solve the user's problems? To start with there are CPM-86, MS-DOS, the P-system and eventually Unix as operating systems. This is par for the 16-bit course. The main item of interest to the APC in particular is that the graphics extension of CPM-86, given the title GS-X, will be available. This provides an extension to CPM-86 involving drivers to a variety of graphics screen and output devices and should make graphics under CPM-86 more portable. For a machine with a graphics strength this is a useful addition.

From the documentation I have seen there are also some useful additions to some of the other operating systems. The P-system (Apple Pascal users note in envy) allows a virtual disk drive to be established in RAM. This will offer a great boost in the speed of many disk-access-intensive operations at a much lower cost than a hard disk. Since I have yet to sight a P-system on any other 16-bit machine I am not sure how general this provision is, but it is certainly a boon.

The documentation from NEC also seems thoughtful and well laid out, a very significant bonus point. The availability of several operating systems opens the doors to a variety of software, at least in theory, and standard languages, such as MS-BASIC, are available. Contrary to the position with some machines both the operating systems and the languages are additional (if minor) costs to the hardware.

The real question with package software on any machine is whether it uses the enhanced features of the machine you are running it on. For instance on a colour machine is colour used for clarifying prompts and information to the user? If not, and you basically use the machine for something like word processing, why have a colour machine? Similarly with graphics, only more so. NEC markets a variety of text-based packages for the APC which have been customised for colour. Benchmark, for instance, is one word processor on offer and here colour codes for prompts, text and embedded characters are well used and can even be user-defined to suit the user's own colour scheme. The quality of the screen display makes long periods of work at the screen easy without excessive eye strain and enables colour to help rather than confuse or dazzle. The spreadsheet programs, too, use colour intelligently. The package software is good over the standard range of products and it would seem that this range will inevitably increase.

Its powerful graphics are under-used

The APC is a powerful and pleasant system for most of the routine tasks suggested above. But for all of that it is under using its capacities as a graphics machine. This is the most unique area and the hall-mark of the APC. It is also the area where software needs to be most customised and where specialist software will be slowest to emerge. What programs are already available for graphics work? Or, for the software writer, how easy is it to write your own? Clearly such a graphics at present requires languages that have been customised to make best use of the graphics capabilities.

The situation with software that uses the graphics capabilities is that it is hard to find here and now. NEC is reputed to have spent a lot of money wooing American software men to produce APC software but news of actual releases seems slow to get to New Zealand. I had a chance to use an artist's utility called "Videograph". This allows the creation of single-screen images using keyboard entry of commands

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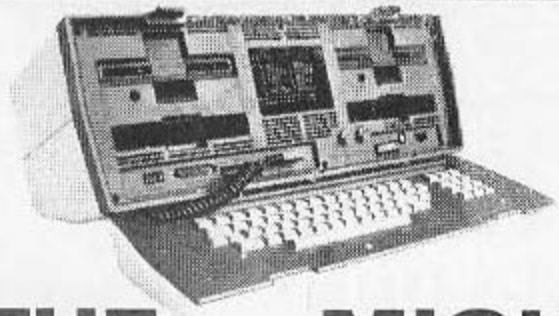

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Microcomputer summary

Name:	NEC Advanced Personal Computer.
Processor:	NEC version of 8086 running at 5MHz.
RAM:	4K CMOS RAM + 128K RAM, expandable to 256K.
ROM:	8K
I/O:	Disks, Centronics Printer Port, RS-232.
Keyboard:	61 keys + 22 function keys + numeric keypad.
Languages:	Standard 16-bit languages will be available (BASIC, COBOL, etc.)
Sound:	Single channel with over two octave range.
Cost:	From $7338.0 (bare system) to roughly $15000 (full colour graphics).
Options:	Include colour, graphics, extra RS232 port, numeric processor and various terminal emulation packages.
Display:	Text on 25 lines with 80 columns. Colour mode offers eight colours (background and foreground). Graphics offers a 1024 by 1024 area displaying a 640 by 475 window.
Character set:	Full ASCII plus graphics and user-defined characters. Shift keys for character graphics fonts.

or a digitiser. It can be used for business graphs or images with a more artistic flavour. This software is a good example of its type, particularly for a 16-bit machine. It allows shape drawing, filling, rearrangement of the screen and so on. Certainly it emphasises the quality of the hardware, especially the monitor.

Harnessing the power of the graphics for your own programs is less easy. Rather like another, cheaper, Japanese machine I know, the standard languages are not directly configured to use what are quite exceptional graphics. Rather for the APC the tendency is to use a "Kernel" of graphics commands accessible from any language. To date, the graphics capabilities are accessible from machine code (and not having sighted details of this I can comment no further) or from Pascal. The latter is provided under the P-System or MS-DOS as an extension of UCSD Pascal through a set of procedures. The graphics commands are compatible with the SIGGRAPH CORE graphics standard emerging in the United States and cover a variety of standard graphics procedures such as drawing empty or filled circles and rectangles. The commands are easy to implement in a program and certainly fast, although as a graphics kernel the subset of commands is not that adventurous. I also discovered that some of the best demonstrations were written in an undocumented BASIC using extra graphics commands. Presumably this will be released soon.

In general, the software for driving the graphics is really only emerging in 1983. As it comes it will offer significant benefits to the APC user for certain applications. The user with hard disks (a 394K graphics RAM eats even 8" floppies for breakfast) and devices to capture high-quality hard copy of the screen image is set to have a very pleasant and powerful working tool. The APC is well provided to utilise advances in software for some time to come. The low-cost CAD/CAM software houses must surely be beavering away on APC utilities.

Summary

The hardware, which is available here and now, clearly offers more in some areas than other machines. It is an interesting blend of a general small machine with some unusually good graphics capabilities. Large disks are a big plus.

The "foundation" monochrome machine, however, is attractive without being truly exceptional. In price and performance it is separated only a little from its peers, although it has many more options as standard fittings. A major advantage it has at this level is its ability to upgrade.

The machine with colour options (an extra $3600 including extra disk drive) offers an enhanced operating environment for business work. It ranks well with other colour-based machines using the 8088/8086 family of processors.

However, the real eye-catcher in advertisements and reviews has always been its graphics. For the buyer purchasing a full-blown colour system the cost increases further but the APC offers some unique capabilities. As a general-purpose machine with graphics, rather than a specialist graphics machine, the APC scores. The real question must be, for the commercial success of the graphics option, who will be willing

NEC APC review

(continued)

to pay for such graphics? Part of the answer to that will depend on the software that shows how such graphics can be used. I am sure software utilising the full power of this screen could persuade many prospective users that the cost was worth it.

There seems to be a rule that the more powerful a PC's hardware the more the hardware is dependent on its software base to sell the extra costs to the buyer. There are many pieces of Japanese hardware that Steve Jobs would not care to run into in a dark alleyway. The APC is a noteworthy piece of such hardware. However, Japanese systems have been lagging in software. The APC offers all the standard business fare with panache and is a significant machine in its own right. In the long run the APC's ability to outdistance its rivals in a fast-changing market place may hinge on the amount of software that can be produced to make using its graphics not just easy but indispensable. It will need software to exploit and flaunt its unique hardware features. The software for this is not yet in place in any depth although it will almost certainly emerge with time.

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Protection from power fluctuations

By PAT CHURCHILL

Power-line noise, voltage fluctuations and power outages can cause problems for computer users. These can include equipment damage, program errors, loss of memory, unnecessary downtime, and costly reprogramming.

A range of equipment designed to protect computers against error causing and system damaging power-line disturbances was introduced at a recent Wellington seminar conducted by Warburton Franki, Ltd.

Power-line noise is similar to static on a radio broadcast, but in a computer environment it can be misread as significant data by a computer, causing untraceable data entry.

Voltage fluctuations can result in unprogrammed data changes and errors in logic and memory.

Power outages or black outs can ruin computer programs, creating the need for time consuming and expensive reprogramming.

A slide presentation covered the Topaz range of power conditioners, Ultra-Isolators, AC line regulators and uninterruptible power systems. Some of the equipment was also on display.

While home-computer owners will not necessarily want to invest in these products, a Warburton Franki spokesman felt the smaller units could be of interest to small-business owners using micros.

Slide slip

The Topaz presentation wasn't without its glitches.

Warburton Franki could get only one slide cassette from the seminar venue operators. After the first cartridge of slides had been shown, it had to be emptied and reloaded.

Thereafter, seminar participants waited with baited breath for each new slide. Would it be upside down or back to front, or both? Or the right way round, even?

After a couple of false starts the third and final cartridge was eventually presented with a success rate of 90 per cent.

The sales manager, Phil Eyton, explained that they were Northern Hemisphere slides.

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QX-10: a strong 8-bit contender

By WARREN MARETT

My Seiko watch has been one of the best purchases I have made. Inexpensive to buy and handsome in appearance, the watch has kept perfect time for seven years. What has that to do with the Epson QX-10 microcomputer?

Epson, well known for its printers and its HX-20 portable computer, is a subsidiary of the Japanese company that makes Seiko watches. Its new QX-10 microcomputer looks as trustworthy as my watch. The QX-10 is also the first Japanese microcomputer I have studied that doesn't look like a Japanese product converted as an afterthought for the Western world.

Microcomputer summary:

Name:	Epson QX-10.
Microprocessor:	Z80A-compatible.
Clock speed:	4 MHz.
RAM:	Main RAM-64Kb, expandable to 256Kb, Video RAM-32Kb, CMOS RAM-2Kb.
Input/output:	Green monitor; dual 5¼ inch floppy disk drives, each 320Kb; RS-232 interface; parallel printer interface, Centronics compatible; Light-pen interface.
Keyboard:	Full typewriter-style keyboard with 103 keys, including numeric keypad, cursor keys, 10 function keys, four special keys and four character set selection keys.
Display:	80 characters by 25 lines.
Languages:	MFBASIC — (a version of Microsoft BASIC).
Graphics:	640 by 400 pixels supported by BASIC commands.
Sound:	Built-in bell; tone can be altered under program control.
Cost:	Basic unit with 64Kb, CP/M and BASIC: $5120.
Options:	192Kb system, $731 extra, IEEE-488 interface, $232. 10Mb hard disk, $5900.
Software:	Peachtree Office Products package, $980. Other CP/M packages available.
Peripherals:	Epson printers — RX-80, $1158; FX-80, $1600; MX-100, $2048. Other printers available.
Reviewer's ratings (out of 5):	Documentation 3, ease of use 4, value for money 4, language 3, expansion 2, support 3.

In particular, its documentation is understandable and it is designed to run standard CP/M software.

Well featured, attractively presented and priced competitively, this microcomputer should get a good share of the 8-bit market.

In New Zealand, it is distributed by Microprocessor Developments, Ltd, which has already shown that it is serious about this import.

MDL has got the QX-10 quickly out to dealers and is promoting a useful library of applications packages. The company mounted a showy tour of the main centres to introduce the QX-10 and succeeded in establishing the machine's credentials.

The company was wise to go for a big initial impact. When products such as Visicon On and the mouse arrive in the country the 8-bit microcomputers will, rightly or wrongly, lose their appeal.

To start with, we should make it clear that this review does not consider the Valdocs version of the QX-10. Valdocs (short for "valuable documents") is a software environment for the QX-10 coupled with a different keyboard (called the HASCI keyboard) than the standard QX-10. It is designed to be used without confusion by people with minimal technical knowledge.

Valdocs keys such as Help, Index, Menu, Mail show that this version of the QX-10 should be very user friendly.

But MDL is pushing the CP/M version of the QX-10 at present and the machine I reviewed at the Small Business Software store in Christchurch was a 192K byte CP/M system.

By now you will all have noticed the stylish appearance of the QX-10. A slim main unit contains two 5¼ inch thin drives and the main electronics. On top of this rests the green screen, and the separate keyboard is connected to the main unit by a coiled cable.

The 320K byte disk drives are very quiet (although not so quiet that you don't get the reassuring sounds of disk accessing). At one stage there were rumbling noises in one drive on the review machine — no doubt a minor malfunction.

A button on the upper left of each drive has to be depressed after the disk has been inserted. It is easy to forget to do this, resulting in the infamous "BDOS error on A — bad sector" message from CP/M.

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Pushing the button again releases the disk.

The screen is easy to read, although the standard font could be bolder.

The QX-10 boasts 16 additional fonts that can be displayed on the screen (and printed on an accompanying Epson printer) when a special software mode is entered. The value of these extra typefaces to the average user escapes me.

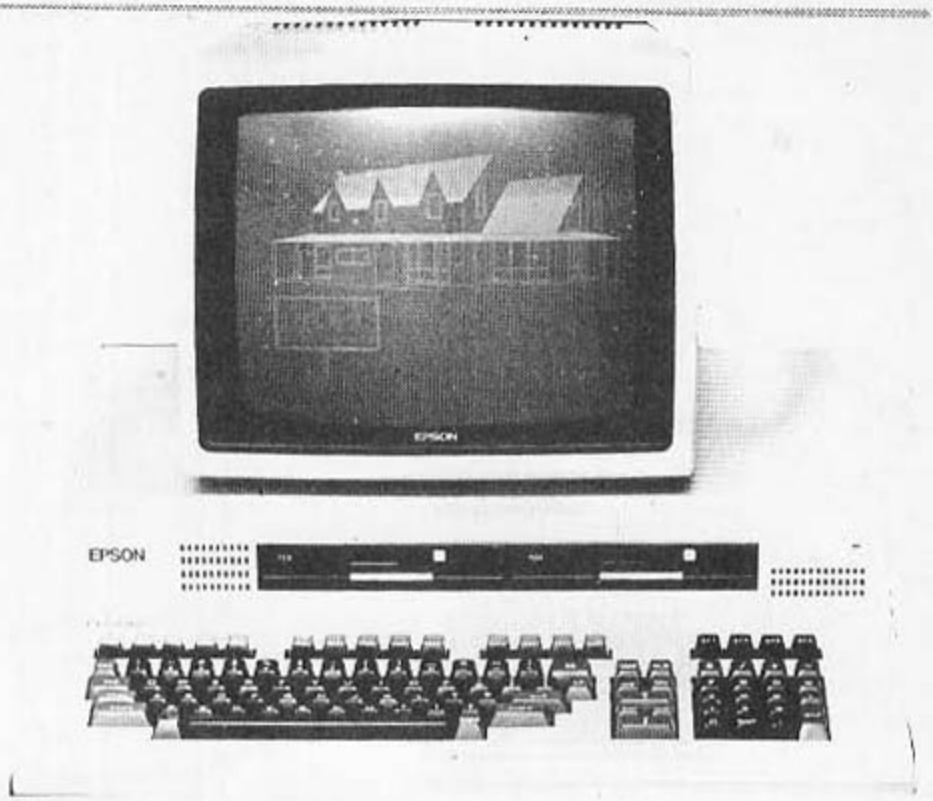
Only one cable connects the screen and main unit, carrying both the video signal and the power. This makes for a tidy package.

What a nice keyboard! It is slim and pleasant to use. There is a typewriter-like main section, a numeric keypad, a set of cursor control keys, 10 function keys, and four special function keys and four keys to choose the font. In all there are as many keys as most people and applications need. The ten functional keys can be loaded by user programs. Under CP/M they default to one set of meanings (e.g. DIR, PIP) and when BASIC is loaded they default to another set (e.g. PRINT, SAVE).

The special function keys are BREAK, PAUSE, SCREEN DUMP and HELP. (The screen dump key wasn't functional on the review configuration in some situations. Apparently, the software package has to know about this key — it is not just a hardware route-through.)

Inside the main unit is a Z80A-compatible microprocessor and up to 256K bytes of memory.

Standard connectors are provided out the back for the screen, a light pen, a parallel printer, and an RS-232 connection. Five extra holes can be punched out to install connectors for up to five addit onal interface boards.



The Epson QX-10

On the CP/M system is another 32K bytes of RAM to hold the screen memory and 2K bytes of CMOS RAM with battery back-up, whose contents are preserved when the power is off (accessible to the applications programmer).

Epson has prepared a version of CP/M 2.2 for the QX-10 called MF CP/M. It is basically a standard CP/M environment which takes advantage of specific QX-10 features.

On a system with 128K bytes or more of memory CP/M and the user's program will take two banks, that is 128K bytes. Of this, the user program can have 56K bytes; the rest holds the operating system and disk buffering (plus the interpreter if MF BASIC is being used).

On a 192K byte system the third bank can be assigned as RAM disk,

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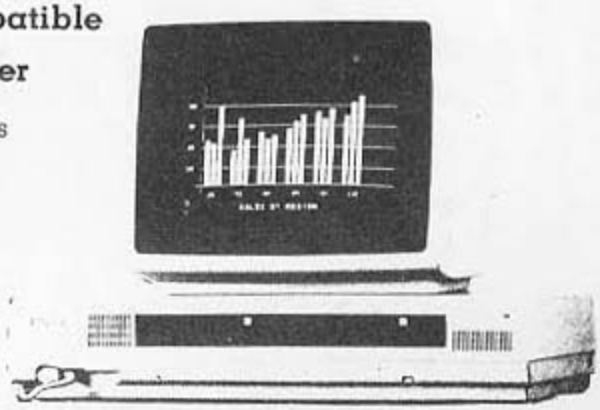

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capable of holding 32 files in its 56K available bytes. A 256K byte system gives you a second RAM disk.

As you can see, the QX-10 has been designed to give good performance. It should be among the fastest 8-bit systems.

Epson's version of Microsoft BASIC, called MF BASIC, is an interpreter which is loaded into one bank of memory leaving 56K bytes in the other bank for the program. It has commands to help the programmer use the graphics features of the QX-10. According to the folk at Small Business Software, MF BASIC's graphics features are similar to those of the IBM PC.

Two spiral-bound manuals make up the documentation for the QX-10. The QX-10 Operation Manual describes the hardware and MF CP/M. The MF BASIC Reference Manual describes the BASIC system.

Despite being the best documentation I have seen for any Japanese microcomputer, they still could be better. Neither has an index and neither is suitable for a first-time user. There is, however, a lot of information in the manuals and the English is excellent.

Epson and MDL are selling the Peachtree Office Productivity Systems modules with the QX-10. They comprise the PeachText word processor, a spelling proofreader, a mailing list manager, the PeachCalc electronic spreadsheet, and a telecommunications module. MDL sells the first four for a total price of $980 — good value for a capable set of programs.

MDL has taken the trouble to collect together and endorse a number of applications packages for the QX-10. They include the Ascent business-accounting software, the Charter series business software, business software from Bay Computers in Tauranga, a surveyor's package from Rotorua, the Medpac medical practice management package, and an interesting-looking business accounting package from Microcomputer Systems of Nelson.

For the price, a 192K byte QX-10 with an Epson printer, the Peachtree software and one of the application packages is an attractive proposition.

Epson has produced an excellent product, but a little late in the market. If the product develops in ways hinted at by the suppliers (with local area networking system due later this year and a 16-bit version in the future) it will firmly establish Epson as a fully-fledged computer company.

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JR-100 Panasonic

A good monochrome home micro

By E.J. BROWN

The Panasonic JR-100 is a compact microcomputer, a little in the Sinclair style, and monochrome only. The case is quite strong and attractively finished in cream and blue; it measures 300mm by 150mm by 45mm high at the back. The keyboard takes up most of the length and slopes nicely towards the front.

There are 45 keys with up to five functions on them. They have a small travel and a good feel to them and seem very satisfactory in every way.

The input/output sockets are arranged along the back. They are, in order: A.C. adapter, input from cassette, output to cassette, external bus (protected by a small cover held by two screws), display monitor and power out for the modulator.

The machine comes with 16K of RAM, and according to the handbook, is expandable by 16K.

The display uses 1K of static RAM, is additional to the other 16K, which is dynamic. BASIC is contained in a ROM of 8K.

The casstte system runs at 600 baud using the normal Kansas City standard. A short cassette tape is supplied with two games and a BASIC learning course on it. I had some difficulty getting these programs to load as the level seemed to be fairly critical. The BASIC course could have been extended somewhat to make it more useful, but it is still quite good. Programs can be loaded or saved in machine-code or BASIC. While loading, and to show that loading is actually taking place, the character being input at that instant is displayed at the top right-hand corner of the screen.

The printed circuitboard of the machine itself looks very workmanlike, containing 26 chips (none of them socketed). There is a 5V regulator on a solid heat sink and a 12V regulator without a heat sink. There is a 5V supply. The CPU is a MN1800 which is said to be a 6802.

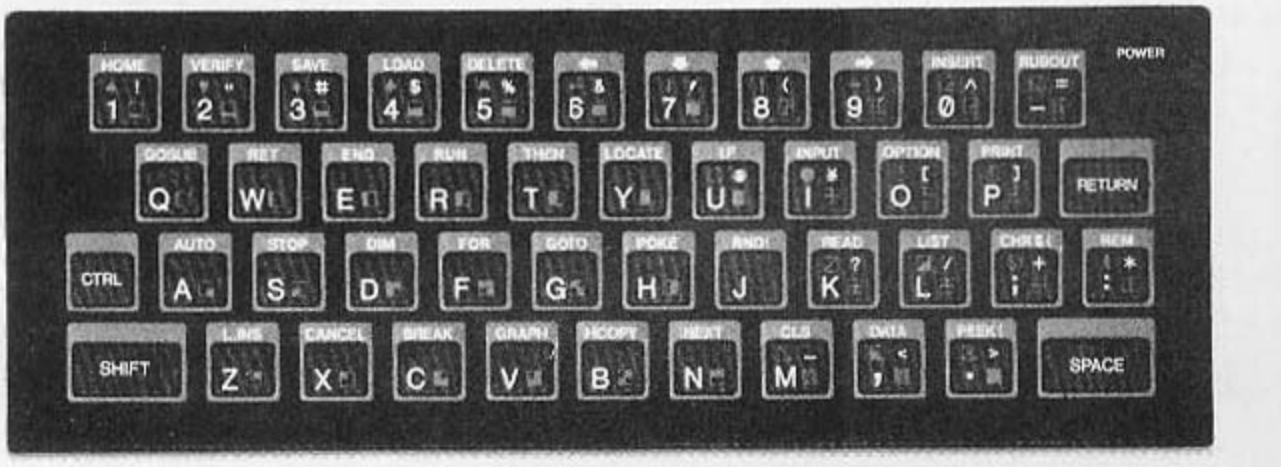
The machine contains a tiny beeper, the frequency and duration of which can be controlled by the program. It is so low in volume, however, that my old ears can hardly hear it. I have no doubt that, once out of the guarantee period an owner could easily feed out the sound to an amplifier.

The modulator is external as is the power-pack. Both these and plenty of cables (for cassette, etc) are supplied in the price. Video output is available for use with a monitor or an adapted television set.

The machine uses a version of BASIC called JRBASIC, which is integer only, and upper-case only. It seems to be Microsoft with a few new words. LOCATE is one of these and does the same job as CURSOR or PRINT AT. PICK is another, and is similar to GET or INKEY$, but it returns the ASCII number of the key pressed; if no key is pressed it returns 0. Another is FLD (field), which is used to invert characters or in conjunction with CMODE to display user-generated graphics. HEX$, HPOS, VPOS, FIND, and OPTION are others.

OPTION is used in conjunction with CMODE and FLD for user-generated graphics. The user is able to create up to 32 of his own graphic shapes. These are made in an 8 x 8 pixel grid (the size of a character); they can be strung together to make any size. They are a little tiresome to make but quite easy to use. They are SAVED with the BASIC program to cassette.

So-called single-key entry is available for 37 statements and



The JR-100 Panasonic

commands. One must first pass control and while control is down press whichever key has the wanted word above it. This still leaves many words that have to be typed in full. The 37 mentioned words may be typed in also, if one prefers.

The character generator contains 63 graphics characters which are very easy to use. Full screen editing is supported and is quite good once one gets the hang of it. All in all it is a very good BASIC. String handling is normal Microsoft.

The JR-100U comes with two manuals. One of these is the setting up and operating instructions, the other is the BASIC programming manual. Both are technically fairly good though the spelling is atrocious and the translation from the Japanese leaves much to be desired. This is more humorous than serious though there are a few places where it is difficult to see what the authors are getting at. In several places capital S is used when they mean $. In the operating instructions, section 2 of chapter 1, is definitely in the wrong place. It dives straight into memory-mapping and machine-code on page 6. Enough to frighten any beginner. Also on page 47, in explaining Right$ it says left end where it means right end. I found several similar types of error. On page 42 of the Basic Manual in the Restore example, line 40 of the program leaves out (70) the very point it is trying to make. On page 49 is a short program to move an object around the screen. This it fails to do because it doesn't erase the old image; it merely leaves a trail of images. This can be fixed crudely by entering an extra line (25 CLS). Throughout both manuals commands, statements and functions are called sentences, which is somewhat confusing.

Summary — I find this quite a useful micro in the home environment though I can see no business potential. It has a very good BASIC and good graphics. It may be priced a little high, and may have arrived on the market late.

Microcomputer summary

Name:	J R-100U.
Microprocessor:	MN1800, which is a 6802.
Clock frequency:	890 KHz.
RAM:	16K plus 1K for screen. Expandable by 16K.
ROM:	8K.
I/O:	Video or Modulated R.F.
Keyboard:	QWERTY layout, no space-bar (just a key). No Reset (pull plug).
Display:	32 characters by 24 lines, Upper-case and Graphics.
Language:	J R basic like Microsoft but upper-case only, Integer only.
Graphics:	236 x 192 pixels. 63 graphic char. in ROM.
Sound:	Beeper, programmable for duration and pitch.
Cost:	$299.
Options:	16K RAM expansion.
Reviewer's ratings (out of 5):	Documentation 4, ease of use 4, language 3, expansion 2, value for money 2.

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Casio FP-1100

Advanced and capable: good for business use

By SELWYN ARROW

The Casio FP-1100

When the Casio FP-1100 system comprising three units, plus keyboard, RGB colour monitor and printer were unpacked, my impression on setting them up was that they are a very stylishly designed, well-matched set. Finished in a cream colour with black inlay areas, the expansion and disk units stack nicely on top of each other. The system supplied for review was the full range of three units as would be required for a business application.

The minimum (personal) system would comprise an FP-1000 system unit, an FP-1001 green display, two connecting cables plus a cable for connection to a standard cassette tape recorder. This could then be added to as required from the other goodies about to be disclosed.

The computer system unit has two expansion slots in the rear, one of which is conrected to the I/O expansion unit. The other had the serial interface inserted. The monitor sits nicely on top of the system unit. The rear of this unit includes the RESET switch, plus printer, tape recorder and video connectors, two general-purpose expansion slots, and a set of six mode switches used

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for determining the initial condition and hardware configuration. These and many more conditions can also be changed at any time under software control.

Inside the expansion unit can be inserted CMOSRAM and EPROM packs.

The disk unit contains two double-sided double density 5.25in. drives, each capable of providing 320K bytes per disk. The cable from this unit was inserted into the rear of the expansion unit on the system supplied, but where the expansion unit is not used it simply plugs into one of the slots in the system unit.

The keyboard is connected to the front of the system unit by 850mm of flexible cable, allowing it to be placed in any position on a desk. As it is so light weight it could just as easily be placed on the lap for "armchair computing", especially as it has 55mm of wrist rest (as all good keyboards should) making it very comfortable to use in any position.

The 95 keys on this well designed sculptured keyboard are soft to depress, but not squashy to the touch. All bar the control and function keys have auto repeat. They also have N key rollover, so I was able to type ahead of the screen display with no loss of characters.The CAPS lock and SHIFT lock keys have LED's alongside to show when they are operative — very useful if you are not used to having both available.

An excellent feature allows the use of the key pad and associated ENTER key as a calculator any time a program is running. Simply by pressing STOP/CONT the program is interupted for calculations. When calculations are completed, pressing STOP/CONT again resumes where you left.

The internal memory is divided into. 10 program areas; these can be any size within usable RAM. Any of them can be called at any time by pressing the SHIFT key and a numbered function key. Program areas are just as easily accessed under program control as they are called by a simple goto (or gosub) prog x statement. This appl es only to an existing program, as it does not appear possible to load a new program into one of the areas and then go to it under program control. Still this is a powerful and useful feature not found in many systems, yet.

Ten function keys are provided along the top of the keyboard. They can be programmed with any valid command or statement for use at any time. At power up they are programmed with the most used commands such as SYSTEM, LOAD, SAVE, COLOR, MOVE, KEYLIST etc. SYSTEM displays the 10 program areas, their name and the number of bytes each uses. MOVE enables a program to be moved from one area to another. KEYLIST displays the current "label" of each of the function keys.

C82 BASIC is very similar to Microsoft BASIC with enhancements to allow full use of the many Casio features. The more powerful of these

Microcomputer summary

Name:	Casio FP-1100 (FP-1000).
Microprocessors:	Main, Z80A compatible, video, 8 bit, type unspecified.
Clock speed:	4MHz
RAM:	112K, User 64K + Video 48K (16K on FP-1000).
ROM:	44K, 32K BASIC/monitor and 4K I/O control + 8K Video.
Input/output:	Two built-in expansion slots on the system unit. Centronics printer inferface. 300/1200 baud cassette interface.
Keyboard:	95 key detachable, comprising: 58 standard keyboard layout, 10 programmable function, 18-key keypad, four cursor, four editing, one break.
Display:	80 (or 40) characters x 25 lines. RGB output for colour CRT. Composite video for green CRT.
Graphics:	Monochrome, 640 x 200 dots x 3 screens, 640 x 400 dots with interlacing (FP-1100 only). Colour, 640 x 200 dots, eight colours.
Languages:	C82 BASIC, plus any other available under CP/M.
Sound:	Beep only.
Cost:	around $7000 for the FP-1000 (monochrome) around $8000 for the FP-1100 (colour).
Peripherals:	FP-1003 High-resolution colour display. FP-1002 Medium-resolution colour display. FP-1001 Green display. FP-1012PR Graphic printer. FP-1060 I/O expansion unit, 4 slots. FP-1020FD Floppy disk drive unit. FP-1035RS RS232C serial interface. FP-1030 CMOSRAM pack (16KB). FP-1031 EPROM pack, 32K max.
Reviewer's ratings:	Out of 5; documentation 4, ease of use 4, language 5, expansion 5, value for money 5, support 4, graphics 5.

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include three screen modes, plus draw, plot, quad, circle, scale, view, and paint graphics statements, 24 arithmetic and 17 statistical functions, several communications commands and many more too numerous to mention.

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SCREEN MODE 1 is high resolution graphics, monochrome only, 640 x 400 pixels. I spent hours investigating this mode.

SCREEN MODE 2 is an eight colour, eight shade, 640 x 200 pixel display with three independent screens available.

Only the first mode is standard on the FP-1000 as extra memory is necessary.

Several COLOR command parameters permit setting the character, background, graphics and out-of-bounds colours individually.

The PAINT statement is perhaps a little slow compared with some 16-bit machines. Interestingly, it fills in colour from the centre of each area downwards before filling in from the top.

Most of the graphics statements include the logical functions AND/OR/XOR/NOT and OFF so that one pattern and its associated colour can merge or override another. Very powerful features indeed.

The two types of packs mentioned earlier fit into the front of the expansion unit. Four slots per expansion unit are available, and two such units can be installed. The FP-1030 CMOSRAM pack holds 16K bytes of CMOS (low power) RAM. This does not form part of the main memory, but is accessed serially as an extremely fast floppy disk. Each pack has an integral backup battery good for more than three years. This means that packs can be removed and replaced as required to provide additional memory storage or custom programs.

Powerful features for graphics

The FP-1031 EPROM pack can hold up to 32K bytes of 'permanent' memory. Its main function would be to use it in a dedicated system application (turn-key operation) or to hold another language or a custom operating system.

This is possible because at power-on the system checks the contents of any RAM/ROM packs present and then checks the floppy disk system for any control program. If present this is loaded into user RAM. Otherwise the 36K BASIC ROM in the system unit, which includes Casio's own operating system, is copied into RAM. This results in a powerful set-up where alternative operating systems (Casio or CP/M etc) or dedicated programs can assume control as required simply by inserting the required disk or pack before powering up.

Software already available for the Casio FP-1000 series includes the extensive range of commercial packages that run under CP/M such as Supercalc, Personal Pearl, Wordstar, SuperSort, MailMerge and Microplan, plus the IMS ASCENT series, and the IAL CHARTER Series. More packages will be available soon.

One package recently released is Casio's retail management system based on acquisition of purchase and inventory data from cash registers, either locally or via the inbuilt communications facilities of the FP-1000 series.

Games, yes! With the great graphics and colour facilities available on this computer it is a natural for games. The family favourite is Golf. We could have spent hours on this very realistic representation of a golf-course course. In defence, I must explain that it is a very good way to learn angular geometry.

Two manuals were supplied, a CP/M manual plus a Casio manual. This last comprises FP-1000 series guide plus C82-BASIC operation, reference, and hardware sections. In all, 280 pages of detail, with examples given on each command and statement. Over all a very good set of manuals written in good English. The examples in particular are very comprehensive. Top marks to Casio on this one.

My over-all impression of this latest offering from Casio is that it has launched the brand fair and square into the business-computer market with an advanced and very capable product it can justifiably be proud of.

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Helping children to read

By EUAN GODLEY,
of the Rowley School,
Christchurch.

As a primary school teacher I am constantly looking for effective methods to teach reading, for just as each child is different, so the methods used to teach each child to read must also be slightly different.

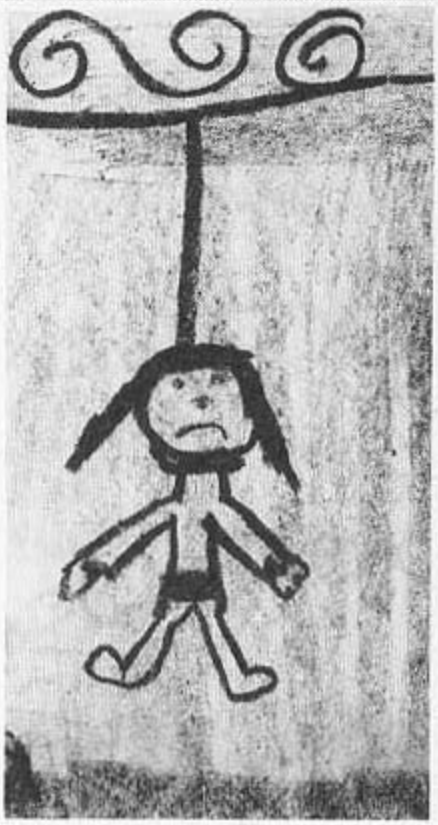
In January I took delivery of a MicroBee computer. On the first day of February my class arrived in my classroom, and I set out to discover what reading level they were at so that I could use that as a base from which to teach. I found some alarming facts. All my Standard 2 and 3 class had a reading age below seven years. On a word-recognition test of the basic 100 words not one child could recognise every word, and some children knew only four words.

Drastic measures were therefore needed, and the MicroBee was pressed into action. I enlisted the help of three friends and together we wrote a version of Hangman in such a manner that the word list in the memory can be easily changed to suit the needs of the particular child using the game.

Hangman is thought of as a spelling game but by supplying the child with a list of the words in the memory it becomes a game where visual discrimination, letter differentation, counting and deduction are the essential skills.

It must be emphasised that the various computer programs are only part of my reading programme. Every day the children hear at least one story, are taken in reading groups, do printing and word-study exercises based on the basic words, and write a story as well as have turns one at a time on the MicroBee.

First a child comes to show proficiency at Hangman, learning to type the letters even though the screen prints in lower case and the keyboard is in capitals. (This is the only disadvantage I have found, apart from not having enough MicroBees! I was prepared to put little sticky labels over the keyboard letters, but I found after one try that



Kuatau Harewa, of Rowley School, has this view of the classroom Hangman.

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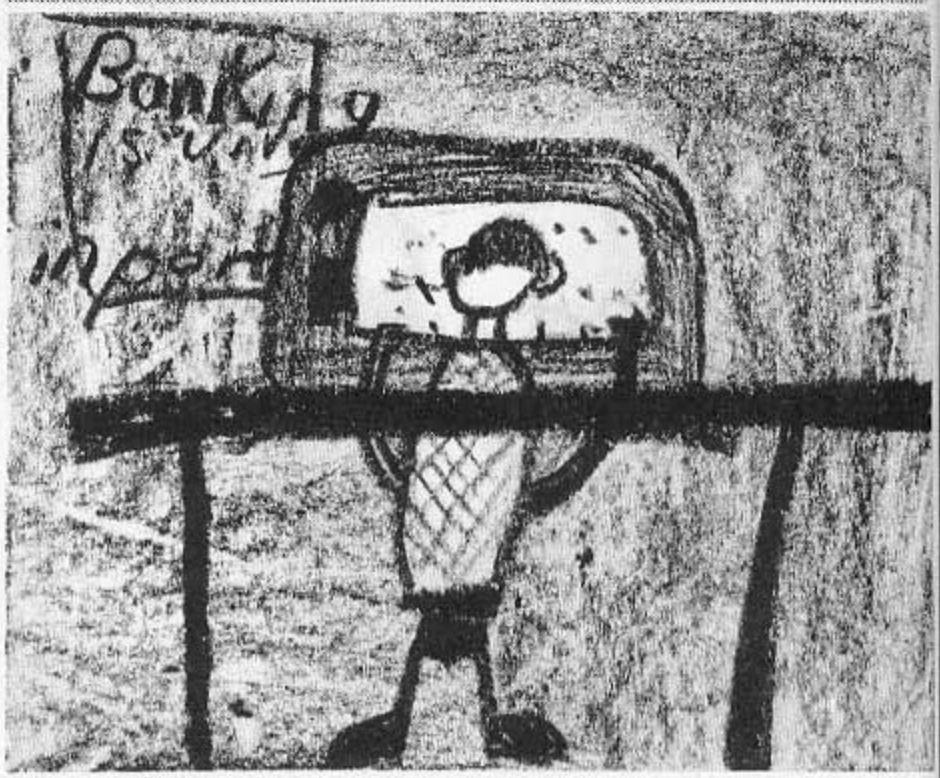

Nine-year-old Jason Leoni, a pupil of Mr Godley's, has this view of the MicroBee in the classroom.

the children were not confused by this at all.)

Then the child is ready for the next game — a game I have called Choose-a-word.

To play Hangman, the child is given the word list and on the screen is a gallows, an alphabet and the directions, "I am thinking of a word, please guess a letter" and the number of letters in the word is dashed on centre screen. The child then guesses a letter and pushes the return key. If the letter is correct it prints in place of the appropriate dash. If wrong, the letter is printed towards the bottom of the screen and a head, the body, then leg, etc appear. After 10 incorrect attempts the body is hanged and the correct word is printed for the student. Another turn then ensues.

Choose-a-Word uses the words from the various basic lists available to teachers, e.g. Spell/Write Essential Lists, NZCER Revised Dolch etc, and by combining these words into sentences and then omitting one word, the game is set.

The screen has a printed list of the particular words from which the answer can be chosen, an instruction about typing in the missing word and then the sentence itself. The child has to read the sentence, understand its meaning, consider words which would fit in the gap and make sense. Teachers will recognise this as the Cloze technique. Should the child guess the wrong word, another chance is given, until it is correct. Another sentence is then printed.

Throughout the day a child comes up to the computer, and has one, two, or three turns, according to the rule of the day. At certain stages, according to the reading ages of the children, the programmes are changed.

The benefits of this teaching aid are numerous. We have dramatically improved the reading ages of the majority of the class. In general, the pupils have made considerable progress in their attitude to school work and to reading in particular. In fact the dramatic improvement in the reading has caused parents to go out of their way to comment to me on the improved attitude and performance of their children.

A surprising conundrum has emerged. Obviously the children are thrilled by new and different games, but to them, Hangman using the 25 words of Essential List One from Spell/Write is a completely different game from Hangman using the 25 words from the NZCER Dolch. In actual fact the only real difference is that the label on top of the gallows says Sp/W E.LK.1 or List A1!

Despite the obvious improvement in their reading, an improvement which I feel is to a large extent due to the computer, when asked recently what they did on the computer, the class chorused the answer, "All we do is play games."

New machines at show in Auckland

By Selwyn and Cathy Arrow

Microcomputers were undoubtedly the prime area of interest for many of the 10,000 people who attended Systems '83 at the Auckland Showgrounds from August 16 to 18. Systems 83 was organised by Trade and Industrial Exhibitions, Ltd, to feature office equipment and business systems. Several companies took the opportunity to launch new products.

The book-sized NewBrain, released by Barr Brothers, of Papakura, is the smallest CP/M expandable micro around and is priced to match at $999. It has a built in 16-character display, video and TV outputs, full-size keyboard and comes with 32K RAM and 29K ROM as standard. Expansion units provide up to 2 megabytes of memory modules, extra ROM, disk modules, and a battery back-up module.

Porterfield Computers, of Auckland, displayed the two new models from Radio Shack: TRS-80 model 4 and the model 100 portable, which was released in the United States in April. This 32K machine with built-in display will retail in New Zealand for $2495.

The introduction into New Zealand of the Pied Piper, a Z80A based microcomputer from Canada, was brought forward a month to coincide with Systems '83. John Peach, of Archives Computers, Australia, who is establishing a New Zealand dealer network, expects its normal retail price including, CP/M and the Perfect software, range will be $3750. Featuring a full-size typewriter keyboard, this 64K portable computer has a 13.5cm mini-floppy disk drive alongside the keyboard.

Particularly aesthetic was the new Panasonic Personal Computer JR-200U, with 32K RAM, due to be released by MEC about mid-October at an expected price of $750. Due for release at the same time is the JR-800U, portable, book-sized computer with an eight line by 32 column LCD screen; it will cost under $1200.

Commodore was displaying its new 8000-N and B700 business computers. Their design based on smooth curves, with no corners, certainly caught the eye.

Priced at $9,700 the IBM compatible Hyperion from Direction Computers rated investigation. One new feature of this 9.5kg compact is its slide-under keyboard, to provide much needed desk space.

Definitely in the big league was the 16-bit Sage Computer, from Rakon Computers. This is a multi-user system based on the 68000 microprocessor.

New software at the show included powerful computer-aided drafting packages for both the Apple and the IBM PC from Powertech Engineering, of Auckland. A remarkable set of modules written by Southern Software, of Parnell, is The Film Management System which includes modules for film planning, scheduling, budgeting and accounting – a product in the export class.

Two colour printers on display were the Canon A-1210, an ink-jet type with four ink nozzles which give seven print colours, and the Prism Color Printer, which uses a four-colour ribbon.

Office furniture designed for the computer user was on display in a variety of shapes and sizes. However, finding a unit that was practical, ergonomically designed and reasonably priced was not easy. Some had simple design faults. So testing out your own system on a desk unit before purchase is a good precaution as good looks can be deceptive.

A very apparent feature was the number of computer services now offered. Several companies offer evening and weekend courses, while many more offer post purchase training.

For those prepared to spend three to seven days learning operation skills, the Microwriter was available at $1445 with a TV interface available for a further $450 from Cardy Business Machines.

Most known brands were present and it was interesting to note that many traditional mainframe companies are now marketing microcomputers.

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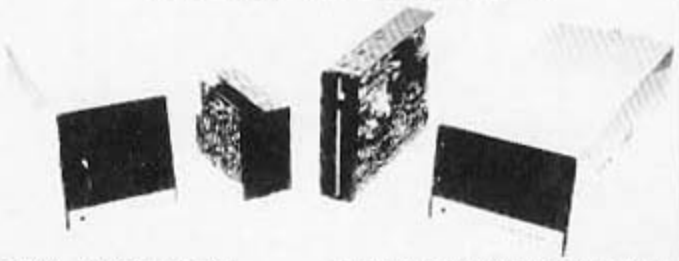

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Low-cost, high-res. colour

By STEVEN CRAGG

The ZX Spectrum's low-cost, high-resolution colour graphics are probably the best feature of the machine and they are controlled by a wide variety of user-friendly BASIC commands.

The most important of these are the INK and PAPER commands. These control the foreground and background colours and take a parameter of 0–9 corresponding to the colours below.

0 — black
1 — blue
2 — red
3 — magenta
4 — green
5 — cyan
6 — yellow
7 — white
8 — transparent
9 — maximum contrast

These are also used with BORDER, which changes the colour of the border. As before, a one digit parameter is used. However unlike INK and PAPER, BORDER uses only 0–7.

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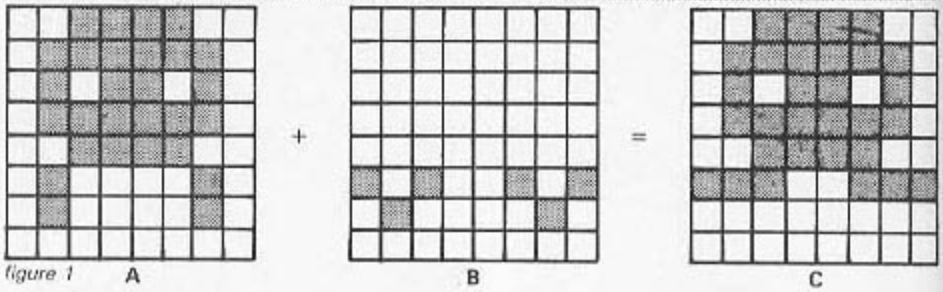

figure 1 A + B = C

If A is overprinted with B, you end up with C.

The most powerful feature of INK & PAPER commands is the way that they can be used either globally or locally. An example of this is:

```
10 PAPER 5: BORDER 6: INK 0: CLS: PRINT "Hello"
20 PRINT PAPER 7; INK 4; "Hello"
```

In this program, line 10 sets the background to cyan, the ink to black, border to yellow and prints "hello" in black on a cyan screen. Line 20 then prints "hello" in green ink on a white strip. The first line is an example of global colours and the second line an example of local colours. Any further printing lines such as

```
30 PRINT "BITS & BYTES"
```

will be printed in the original colours, unless the global colours have been changed.

The facility for flashing characters, two levels of brightness, inverse and overprinting are also provided. These commands have a parameter of either 0 or 1 corresponding to off or on respectively. These can be used in the same way that INK and PAPER are, i.e. either globally or locally. For example:

FLASH 1 sets printing to flashing.
BRIGHT 1 sets printing to be extra bright.
INVERSE 1 inverts the INK and PAPER colours.
OVER 1 sets overprinting to be 'on'.

I feel that overprinting warrants further explanation. When this is set any printing does not simply replace what is already in the character cell, instead it performs an exclusive OR (XOR) operation between each of the 64 pixels of the old and the new characters. If you are still confused see figure 1.

Two other commands are particularly useful when using block graphics, ATTR and SCREENS, which are used to detect what is at any particular screen position.

ATTR (x,y) returns a number corresponding to the status of the specified character cell, i.e. whether the character cell is flashing, brightness is set and the particular ink and paper colours. A point to note is that the way in which this is held in memory means that each number matches with only one combination of the attributes.

SCREEN$ (x,y) returns as a string the character that appears at the specified character cell. If the character is a user defined graphic it returns a blank and if the character is unidentified it returns a null string.

Both of the above commands are very useful in games etc. for detecting collisions.

The above commands are mostly for control of low resolution (block) graphics, but the Spectrum has high resolution graphics as well. The commands for these are PLOT x,y DRAW x,y CIRCLE x,y,r.

PLOT x,y plots (sets) a pixel (point) on the screen corresponding to the x,y coordinate specified. A point to note is that 0,0 is in the bottom left hand corner of the screen as opposed to the printing 0,0 which is in the top right hand corner.

DRAW x,y draws a straight line from the current plot position to the point x pixels along and y pixels up. The point, x & y, can, of course, be either positive or negative. If desired, DRAW can have a third parameter thus — DRAW x,y,r where x and y are as before and r is the angle in radians to be turned through before reaching the pixel specified, e.g. DRAW 100,100 PI will turn through a half circle before reaching the pixel 100 along and 100 up from the current plot position, care must be taken that the line does not run off the screen.

CIRCLE, x,y,r draws a circle centre x,y with a radius or r pixels. As with the block graphics ink and PAPER colours can be used either globally or locally.

QX-10 Customers

"QX-10 sales have exceeded 150," says Mr Keith Redit, manager of the Epson Computer Divison of Microprocessor Development, Ltd, Auckland. Five units have been installed at Auckland Technical Institute and the National Poisons Centre in Dunedin and the National Acoustic Centre have each purchased one.

The BITS & BYTES Computer Book Club

CP/M and the Personal Computer
Thomas A. Dwyer & Margot Critchfield

Two authors known for their down-to-earth explanations of computing intricacies have produced an up-to-date guide to the microcomputer disk operating system. They break CP/M into its components and combine their explanations with applications and self-study techniques. New users get a "quick tour" of CP/M and there is an insider's view of CP/M's four main applications.

Addison-Wesley — **Our normal price $39.20.**

Osborne CP/M User Guide
Thom Hogan

Bridges the gap between technical manuals and users' working knowledge of computers. Provides basic, practical information you need, then details all CP/M commands and describes compatible support programs. Many tables and lists as operating references. For more advanced users, the relationship between CP/M and other operating systems is examined, and applications and use of CP/M for program development is discussed.

Osborne/McGraw Hill — **Our normal price $31.50.**

CP/M Primer
Stephen Murtha & Mitchell Waite

Information on the latest CP/M 2.0 version, disk allocation and extents. Tear-out reference card and extensive list of CP/M software.

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CP/M Bible
Mitchell Waite & John Angermeyer

Reference guide to CP/M, covering all built-in and transient commands. Compares CP/M versions and looks at optional utilities. Describes BASIC, PASCAL, MAC, CBASIC and CB-80. Includes detailed command summary card and extensive bibliography.

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Unlocks the secrets of how to use the hidden power of your CP/M system. Describes the workings of CP/M, and offers a DDT code-fragment approach for getting started quickly. Teaches 8080 assembly language programming, how to use CP/M system calls, how to access CP/M from BASIC, and how to modify BIOS.

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Our new selection

User's Guide to Microcomputer Buzzwords
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Aimed at users who need to know basic terminology to understand computer language. Written for those who don't care what happens inside a microcomputer but who must be able to communicate with others who do.

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Executive VisiCalc for the Apple Computer
Roger E. Clark

Shows how to forecast sales, model budgets, perform financial analysis, and how to use VisiCalc for your specific needs. Guides you through the less widely known aspects of VisiCalc and offers tips on getting started, command statements, logic, sample business models, and hardware options.

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The Microprocessor Handbook — **Elmer Poe**

Handy, single source of complete specifications for all widely-used microprocessors. Includes hardware and software characteristics, and contains annotated specifications to help you understand how each machine works. Uniform layout and used standard terms explained in first chapter.

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Computer books to read and use

Introductory

Basic Computing
A Complete Course — **Tim Crawford**

Provides a broad-based introduction to computer science and data processing suitable for a variety of levels in high schools, universities or industry. Begins with questions such as What is a Computer? Where Did Computers Come From? Gives detailed coverage of computer languages, programming, program structure, logic, testing, documentation and program maintenance.

Osborne/McGraw-Hill — **Our price $26.10. Save $1.40 and earn 2 bonus points.**

Mastering Computers — **G.G.L. Wright**

A good introduction for the initiated, or for use as a text in a computer-appreciation course. Covers the field from the basis of mainframes, through such everyday applications as bar coding to the possibilities of videotex and an electronic money system. Well written, concise, and well illustrated.

MacMillan Master Series — **Our price $9.45. Save 50c and earn 1 bonus point.**

Microcomputers in Plain English for New Zealanders. — **Brian Strong**

The first computer book for New Zealanders, and the book for the first-time computer users. Clear, precise and often humorous introduction to the world of the microcomputer for business people, those at home, farmers and teachers, industrial technicians and sports administrators. Assuming no previous knowledge of computers, the author explains the different uses of microcomputer, the way it works, the jargon of the industry, and the various equipment and programs available.

Reeds — **Our price $7.50. Save 45c and earn 1 bonus point.**

Keyboarding

Quick Keyboarding — **Vonnie Alexander**

Sub-titled "Competent Keyboarding in 6 Hours", this book by New Zealand Vonnie Alexander has a unique method for teach-yourself competent keyboarding. A wall chart of finger positions is included.

Methuen — **Our price $6.50. Save 45c. and earn 1 bonus point.**

Keyboarding for Information Processing — **Robert Hanson**

Enables a person to develop basic touch keyboarding skill in a minimum time. The person who completes the book will be able to key in alphabetic, numeric and symbol information; input numbers on a seperate 10-key pad; keyboard information quickly and accurately; understand some of the basic vocabulary used in keyboarding. Can be used for classroom or individual, self-instruction.

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General

Boolean Algebra for Computer Logic — **Harold E. Ennes**

Knowledge of Boolean algebra is a must for anyone wanting to understand the design of digital computer logic circuits. This book provides that understanding without the reader having to know higher mathematics or advanced electronics. Many line drawings and worked examples. Exercises and allow self-testing (answers included).

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Microcomputer Math — **William Barden Jnr**

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Language/programming

Beginning Basic — **P.E. Gosling**

An introduction to the language for first-time users. Also has lots of interesting digressions about such devices as tape readers.

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Forth Programming — **Leo J. Scanlon**

Written for anyone who wants to learn how to write computer software using FORTH. Shows how to add new operations (words) to the language and how to manipulate the stack. Describes both FORTH-79 and fig-FORTH, identifying programming differences. Includes more then 50 programs which will execute with little or no modification on any FORTH system.

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Pascal for the Apple (book 9 disk) — **Iain MacCallum**

Provides an introduction to Pascal as a first computer language. Use your Apple to help you learn programming Pascal. Uses graphics extensively — to entertain, provide experiments and programs, and teach the serious principles of program construction. Written as a self-teaching guide for those working alone and for students. No previous experience assumed.

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Learning LOGO in the Apple II — **McDougall, et al**

LOGO's a Piaget-based way into computing. A multi-purpose language. Non-technical, learning by doing.

Prentice-Hall — **Our price $18.05. Save $1 and earn 1 bonus points.**

Basic BASIC – English Dictionary — **Larry Noonan**

Specifically for users of the Apple, PET, and TRS-80 who have found programs in magazines or books that were exactly what they wanted, but were written for some other computer.

dilithium Press — **Our price $20.80. Save $1.15 and earn 2 bonus points.**

Discover FORTH: Learning and Programming the FORTH Language — **Thom Hogan**

Whether you are a beginner seeking information on this multi-faceted programming language or a serious programmer already using FORTH this book is a reference that should not be overlooked. Describe FORTH syntax, specifically applicable to both FORTH 79 and FIGFORTH.

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Microsoft Basic (2nd edition) — **Ken Knecht**

Shows how easy it is to learn to program. A comprehensive tutorial on programming using Microsoft versions 5.0 with the TRS80/System 80 and other generalised CP/M based systems as examples. This edition has a new chapter on the Microsoft BASIC compiler.

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The 68000: Principles and Programming — **Leo J. Scanlon**

An introduction and full description of the highly complex and powerful 6800, 16-bit microprocessor, and how to program it. Starts with fundamental material and gradually introduces more involved topics in an orderly manner.

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Parlez-vous BASIC — **R.J. Campbell and M.R. Ellis**

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Phase 3 Electronics — **Our price $8.50. Save 50c and earn 1 bonus point.**

Mastering Computer Programming — **P.E. Gosling**

A complete, self-contained course from Britain for self study at home, or for use in the classroom, in one book, the essential information to learn programming. The language taught is BASIC. The author, a former lecturer in computing, runs a computer services company.

MacMillan Master Series — **Our price $9.45. Save 50c and earn 1 bonus point**

VIC

Start with BASIC on the Commodore VIC 20 — **Don Monro**

Don Monro is one of the snappiest, most humorous, and easiest to follow writers on beginning computing. This book with its illustrations by Bill Tidy, is an excellent guide for VIC 20 owners. The helpful exercises and line drawings make learning a snap.

Reston — **Our price $19.25. Save $1.05 and earn 2 bonus points.**

Vic 20 User Guide — **John Heilborn & Ran Talbott**

Designed to help you enjoy your computer time whether for entertainment or practical applications. Shows how to operate the VIC 20 and all its peripherals, program in VIC BASIC, use the machine's full range of colour graphics and sound capabilities, build a custom character set, and learn advanced mathematical programming.

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Some Common BASIC Programs: Atari Edition — **Lon Poole et al**

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Assembly Language Programming for the BBC Microcomputer — **Ian Birnbaum**

A guide on how to get the most from your BBC. Covers addition and subtraction; decision making and loop structure in assembly language, indexed addressing, multiplication and division, the stack, subroutines and interrupts. Offers some utility programs and provides answers to exercises.

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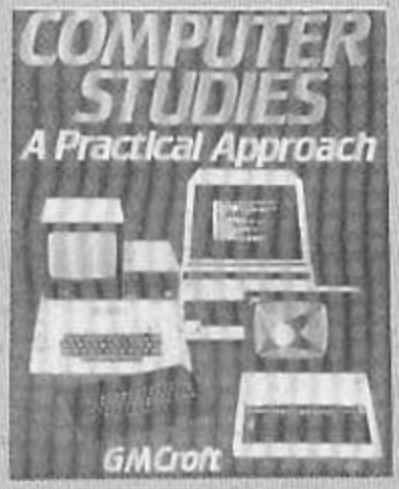

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Sinclair

Advanced Programming for the 16K ZX81 — **Mike Costello**

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THE COMPUTER SCHOOL

Sweet 16: dream and reality

BY PIP FORER

The farm animals in George Orwell's "Animal Farm", looking to find a simple rule to judge creatures, came up with "Two legs bad, four legs good". The equivalent in microcomputing circles might be, "eight bits good, 16 bits better".

Generally people seem to feel that 16 bit computers are inherently faster, bigger, more powerful and more desirable. Are they all of these things, or is that belief all part of what has been best described as the conspicuous computing syndrome? If 16-bit machines are so great and getting cheaper what do 16-bits offer to informal (non-business) users as their prices drop? After all the first 16-bit home computers are already around in the form of the Texas 99/a. Will more ambitious 16-bitters supercharge the home machine dramatically?

In general, there is only one thing you can rely on 16-bit machines for: greater direct memory addressing space. There are often lots of other things in addition to this — but there are also pitfalls. One reason for this is that there are various kinds of 16-bit machines.

Let us look quickly at four well-known chips used as processors in such machines. Fuller reviews of these and others can be found in the April "Byte" or in "16-Bit Microprocessors by Titus and Titus" (Blacksburg Publications). These four are the 8088 and 8086 (both from Intel) the Motorola 68000 and the National 16032. All of these chips have been labelled as 16-bit, yet the range of performance between them is probably greater than between the least powerful of these (the 8088) and many 8-bit processors.

The reason is that each chip offers different facilities in two key areas: the data bus (the highway sending values around within the machine), and the number and type of addressing and other registers available. (Registers are the usually locationless inner sanctum of the computer, containing information on currently actioned instructions.

Basically, the more bits in these components, and the more registers in general, the greater the memory range and the faster and more flexible the operations that can be carried out. For instance, look at a typical 8-bit micro that wants to take a value from somewhere in memory and do something with it. It has an 8-bit wide data bus, so that only one byte can be moved at a time. It typically uses a two-byte address range (= 16 bits in total, giving 64K addressable RAM) and it has to take double-time in expressing this range since all its registers and its data bus have only 8 bits. With only five registers in all something like the 6502 chip frequently has to do a lot of shuffling to get things done.

The 16-bit chips get round these problems.

Sixteen-bit chips tend to have more registers (although not strictly related to being 16-bit chips). However, some have more than others. Most have 16-bit data buses, but some have only 8-bit ones. The best-known of these is the 8088 chip used in the IBM PC, the DEC Rainbow, the Sirius, and the Panasonic JB3000. This has an inherently greater memory range and more powerful assembler instruction set (which is based on 16-bit rather than 8-bit opcodes), but the 8-bit bus means a lot of double-shuffling goes on whenever anything goes along the bus. Its faster sister, the 8086, is "true" 16 bit with a 16-bit bus. With a 20-bit address code, the 8088 and 8086 can both address a megabyte of memory.

The 6800 and 16032 both feature 16-bit data buses but also have more registers, many of which are up to 32 bits long. (see table). With a data

CHIP PRODUCER	RAM ADDRESS RANGE	Dat Bus	No. of Regstrs	Maximum Bits	Min Bits
8088 Intel	1Mb	8	14	16	16
8086 Intel	1Mb	16	14	16	16
68000 Motorola	16Mb	16	19	32	16
16032 National Semiconductor	16Mb	16	16	32	16

register handling 24 significant bits the 16032 and 68000 directly address 16 megabytes RAM. While an 8088-based machine running BASIC may be 30% faster than some 8-bit machines the other chips (partly due to later development on superior technology) represent a significant step-up again.

What do the 16-bit business/personal machines at present around tell us about what a 16-bit budget computer might look like? Very little. It is to be hoped most of these machines use 16-bit technology to get larger memory sizes so that they can upgrade the largest problems they can deal with (a bigger spreadsheet for instance).

However, in the rush to market many early units used software not optimised for 16-bit operation but simply translated over from 8-bit versions. (hence slow BASIC's among other faults). Some of that software is not even designed to use the full memory range available. Furthermore, faced by the awesome possibility of 512K or a megabyte to romp in, the systems confronting the users have become more like a mainframe than 8-bit machines. They are powerful but unfriendly for the new user.

The most clear instance of this is with operating systems. If you run an Apple or Spectrum or BBC you may ask, "What is that?" Essentially, it is what comes up when you turn on. It lets you list files and so on and is very simple.

Aiming at a more demanding market the two most used 16-bit machines operating systems, CPM-86 and MS-DOS, offer much more but are as friendly (and entwining) as anacondas.

Furthermore, these systems are loaded from disk, as are all their languages. That takes up RAM. A 128K notional machine suddenly shrinks to less than half that size once BASIC and the operating system go in. All a bit rough round the edges for users with a different pattern of man/machine interaction (like home users, hobbyists and educational programmers) who are weaned on ROM-based BASIC and operating systems. I think (and I certainly hope) that the operating environment for non-business users has yet to emerge, although the supporters of metaphor-oriented approaches such as Smalltalk and Lisa may be pointing the way ahead.

Business: Software for boring things

The fundamental difference between business and home/education users is that most current business software aimed at micro users (typically single-user, small businesses) does boring things needing a lot of memory but little speed. Mailing lists and small data bases are a case in point. Sixteen bits are just a passport to the memory needed. The non-business market wants a host of different options, most of which involve graphics which are heavy on memory, processing and speed needs. The best advances here will involve the faster 16-bit chips and will be heavily software determined.

Here is a list of heady predictions to stir some debate. First, the early and cheaper 16-bit non-business machines will not initially improve graphics resolution significantly. This will be because of monitor-cost constraints and (if still using television as a monitor option) the constraints of domestic television standards. The slower 16-bit chips could, in any case, not offer the speed for enormously finer detail in fast animation.

Rather, the extra memory will be used to allow elimination of much disk loading and the simultaneous handling of different aspects of a task. The extra memory will be capitalised on to act as a "fast disk" and allow instantaneous movement between components of tasks. Existing 8-bit machines already do this with ROMs and paged memory. The 16-bit machines initially will just extend this and make it all neater and more standardised.

Second, 16-bit home machines will appear and dominate the market only when disk prices tumble and capacity rises. When we have a 512K RAM home machine (and it is only at these sizes that slower 16-bits really start to show their talents) a 160K disk drive is pretty miserable . . . and its load speed will seem funereal. The standard 8-bit machine has worked with a typical disk to RAM storage ratio of at least 3:1 and often far higher. A half-megabyte machine needs 1.5 megabytes of disk to meet the same criteria. The top 5¼ in floppy on sale in New Zealand at present scrapes towards this with 1.2 megabytes. The new machines will need new disk technology: either cartridge hard disks or laser-read disks.

Third, the software base for a 16-bit machine has yet to be produced for the home end of the market, apart from the IBM PC stable which is based on the low end of the 16-bit spectrum. In non-business uses, the buyer wants an exciting and entertaining product. It will be some time before the newer chips attract the market base for that software to be economically worth producing. It will take a significantly cheap product from a major supplier who can guarantee large sales to get that software authored, and it will be that software and that guarantee which will determine if the new workhorses turn out to be Japanese, American, or European.

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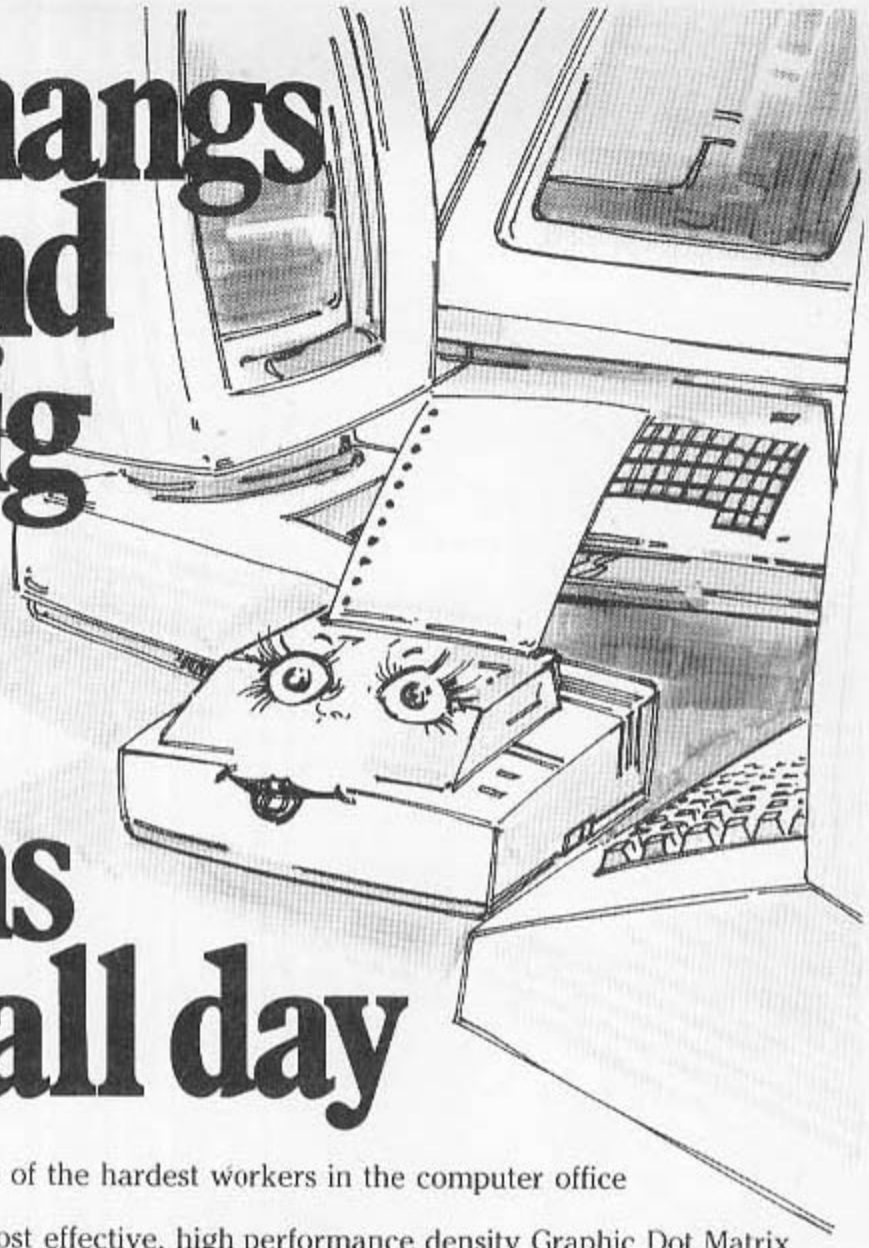

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Language the key to consciousness

By JOHN DURHAM

Much has been made of the ability of computers to do large amounts of difficult or tedious calculation in a fraction of the time that it would take a human being. Indeed, the average computer, once it is told what to do, seems an extremely capable device able in many cases to replace human labour completely, we hope so that the human being can go on to perform more useful or meaningful work.

Despite the fact that computers seem to do these jobs so well, and even though many of these same machines can now out play a grand master at chess (to quote a common example), most people generally agree that computers display no signs of what we call real intelligence. On the other hand, most people are only too aware that if computers are capable of intelligence, then we are approaching the day of the autonomously intelligent machine as soon as technology can bring us to it. With all these things being almost matters of general knowledge in these enlightened times, it seems odd that in spite of such knowledge our understanding of the nature of intelligence itself, or what makes up a conscious being is mostly fragmentary and poorly developed. Since the question of "what is intelligence?" and "how could a computer become conscious of itself?" have subtly influenced my programming work over the last few years, I have taken the chance to record a few observations by way of comparing the operating of the "intelligent" human brain with the "imbecillic" microcomputer.

The fundamental difference between the operation of the human brain and the operation of a computer is that the human brain has a vastly greater number of processing units working together at the same time than does a computer, which usually only has one central, or microprocessor. The difference is what gives rise to the brain's superior flexibility and reasoning power, since it has the facility to process its information simultaneously through thousands of channels, while a computer must do so one item at a time.

The prime factor in the evolution of consciousness is language. Human languages may contain millions of unique and individual words, while even the most sophisticated computer languages can cope with only a few hundred words. An entity can become fully aware of itself only when it is able to express its awareness in some recognisable form of language, both to itself and to others.

Human beings make conscious decisions by using the rules of logic (or syntax) upon which their language is based to work out what to do in a new or complex situation. Computers, on the other hand, execute a series of tests and comparisons in order to decide which operations to perform.

A computer having the same number of microprocessors as there are processing units in the brain, and having a language based on human communication laws and concepts would be vastly superior in both processing and reasoning power to any mainframe computer or any living human being.

An intelligent computer may never have to take or pass the Turing test (where a human converses with another human and a computer over two terminals, and has to determine which one is the real computer), because its intelligence is likely to be unclouded by human values or prejudices, and would be an intelligence of a type distinctly different from that of a human being. The Turing test would be rendered invalid by such an entity, since it is based on the precept that a computer to be intelligent must be human-like in its thinking.

From the above observations, it is possible to deduce that such a computer would have a structure based on a large number of small microprocessor operated units, each semi-independent, but each designed to perform a task which is a particular part of a whole system. The processing power of the whole system would not be dependent on the size of these units, but rather on the number of them, and the extent of their specialisation.

As shown in figure 1, the system would be arranged in a series of communicating interfaces, each having a unique function, each able to do some processing of its own data before passing it on to the next unit for actioning. Each unit is shown as a block named according to its function, and each block would contain one or more microprocessors suited to the job to be performed. There follows a brief description of each block in the diagram, showing how its function relates to the whole system.

Monitor: This would be an easel-type monitor with addressable pixels, separate video memories for graphics and ASCII or other alphabetic characters, able to store shapes and move them independently of each other. It would be able to receive characters from the keyboard or the master control interface, displaying each as required, and send any screen of

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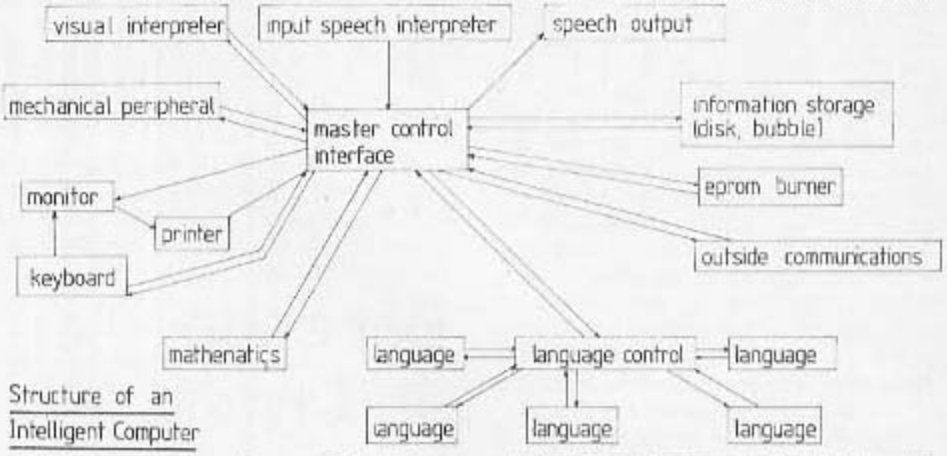
either graphics or ASCII to the line printer.

Keyboard: A complete microcomputer keyboard with operating-system on ROM, direct parallel link to the monitor, and to the master control interface from which it can receive or send data or instructions to the rest of the system as required. The keyboard could also support cassette or disk interfacing, such as are commonly found on microcomputers today, for the purpose of running programs without contact with the main system.

Mathematics: A microcomputer without screen or keyboard dedicated to mathematical problem solving. It would have a ROM operating system plus about 48K of RAM for the purpose, and would receive its instructions from and send its answers to the master control interface.

Printer: Consists of a microprocessor-controlled memory buffer connected to a standard line printer. It would be able to communicate on a priority basis with both the monitor and the master control interface, absorbing the characters to be printed, and freeing both devices to go on operating while a printout is produced.

Audio interpreter: A microcomputer whose sole job is to translate sounds received through a microphone into meaningful words, and send them to the master control interface for actioning. It would most often be tuned to the voice of one operator, and recognise a set of key words spoken by the operator when requested.



Structure of an Intelligent Computer

In the September issue of *Bits & Bytes*, this diagram incorrectly was printed with another article.

Visual interpreter: Television-based, shape-recognition system, able to discern and recognise common shapes in its environment, and send the information to the master control interface.

Speech output: A microcomputer designed to receive text from the master control interface and translate it into phonetic speech.

Information storage: A large store of non-critical information and programs on disk or in bubble memory devices, having the ability to place any desired information directly into the memory of the master control interface while the interface may be performing other functions.

Outside communications: A microprocessor controlled buffer for sending, receiving and absorbing messages passed between an RS232 interface and the master control interface. It would be programmed to deal with all communication protocols required, and free the master control interface as much as possible while communicating with outside computers.

Language control: A highly specialised microcomputer capable of using and interpreting the syntactical rules and requirements of a very large language, so as to break down real sentences into meaningful words for interpretation, and use the same rules to compose meaningful replies to questions asked. This unit does not actually contain the language, but communicates with a cluster of associated computers which contain the stores of words and word types from which the language is formed. It forms the language source for the master control interface.

Language: One of a group of microcomputers dedicated to recognising, looking up or providing words or spellings requested by the language control unit. Members of

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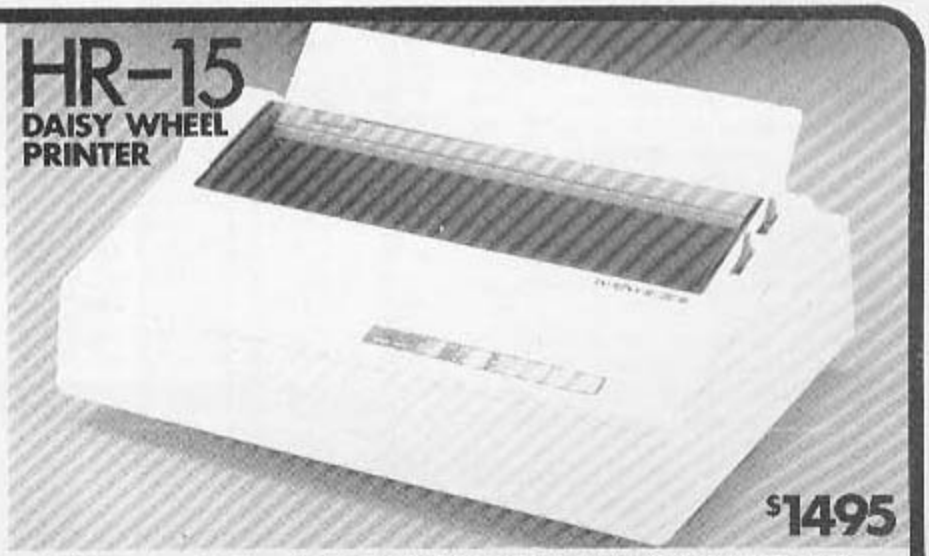

Whitcoulls 21 COMPUTER CENTRES THROUGHOUT NEW ZEALAND"

the group could be divided up as best suits the syntactical rules of the language into groups like "nouns", "verbs", "adverbs", "adjectives", "prefixes and suffixes", etc.

Master control interface: A microcomputer containing the current operating program for the system. It has the job of running the program and making use of all the other interfaces to best produce the desired result. In advanced systems, this would involve all the relative value judgments to be placed on information arriving from outside the system, and would contain the fundamental instructions or precepts of the program to be run.

Mechanical peripheral: A microcomputer controlled system for manipulating mechanical hydraulic or electrical arms, tools, machinery or objects within the computer's environment. It would also include such devices as a power trolley or other means for transporting the computer from place to place.

EPROM burner: At certain times, the computer may determine that it requires expansion, and may request that EPROM's be provided for burning new information into. Such information may be in the form of language expansion or the addition of new programming or better interfaces. At such times, a new board or chip would be added to the existing machine by the user.

It is not too difficult to picture just what sort of thing the computer would be if it were constructed along the lines of the one described here. Development of the language for running the system would be a slow and difficult process, taking years to complete in the hands of very skilled and patient people, while producing the hardware would be quite a task to begin with.

In spite of the difficulties involved, this type of machine will one day be built and programmed, and eventually even miniaturised to the stage that possibly one day it may even apply for the same job as you, and join you in the waiting room.

Hardware and software developments of this nature are being investigated by Modec Instruments Ltd.

Anyone wishing to enquire or become involved in this type of development should contact me at Model Instruments Ltd, 16 Hudson Ave, Upper Hutt.

Articles on artificial intelligence will be printed in BITS & BYTES from time to time. Our first contribution on the subject puts forward some interesting views on consciousness. Others interested in contributing articles on the subject should contact the editor.

HAND HELD

It is of interest that IBM has recently announced a holographic scanner that identifies bar codes from diverse angles. The scanner on the IBM 3680 point-of-sale system uses a three-dimensional pattern of laser beams that wrap around the products searching for their product codes.

Bar coding is generally thought of as a computer input for supermarket check-outs and other points of sale.

But it has an application to personal computing, especially hand-helds. MIKE THOMSON reports here on his machine's optical wand, or bar-code reader.

Bar code and wand beat keying in

For a Hewlett Packard 41C calculator one of the interesting accessories is the 82153A optical wand. This finger-held device plugs into one of the interfacing slots at the head of the 41C.

The wand is an input-only device. It is designed to read rows of printed bar code. You scan the code holding the wand much as you would a pencil. The wand reads the printed bars, which represent binary code. The narrow bars, zero, and the thick ones, one.

Scanning inputs data and programs into the 41C in a quick' easy, and inexpensive way. For instance, all of the 41C programs available from the Hewlett Packard Corvallis Library (and there are thousands of them) come with the complete listing in bar code, photo-copied on sheets of standard writing paper. A number of books are being published with the programs printed in bar code and incorporated with the text. This makes for easy and accurate loading.

Most of the bar code published is made on a computer system incorporating a photo-typesetter, although you can make it by hand (as I did for the strip that reads 'BITS AND BYTES'). With HP's latest printer, X function module, and IL circuit you can generate your own. However, it is possible to embark on a number of interesting projects using nothing more than simple, stick-on printed labels.

Hewlett Packard supplies with the wand, some self-adhesive bar code labels. Every function available on a standard 41C and its printer and card reader, besides the decimal numbers 0 to 65, are represented in bar code on a printed sticker.

Using these stickers it is a very easy matter to make up a moderate length program listing.

Write the program first, and then stick the appropriate label in a row or vertical list. You can photo-copy this list, send it to a friend, or store it in a binder. (A tip: If you stick the labels on glossy paper they will peel off easily for re-use.)

To use your listing just scan the labels one by one in order of execution. The program will be quickly loaded into the 41C, quicker by several magnitudes over keying it in.

Speed in programming can also be taken advantage of by using a printed keyboard to enter programs (H.P. supplies this with the wand).

Microbee Programs

BEEMON: Hex code monitor for the Microbee. Updated versions $25.00 with instructions.

RELOCATE: Machine code program relocators for Microbee, TRS-80, System 80. Full instructions $12.00

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BITS & BYTES

An example of hand-made type 7, alpha-replace bars that, when scanned by the HP82153A optical wand connected to the HP41C, will display "BITS & BYTES".

An example is the line 'XEQ PROMPT'. This requires 11 keystrokes to enter, but with the wand a scan over a short bar takes but a moment.

Useful as the 82153A wand is for program and data input, it's the other things you can do that enhance your hand-held 41C to do something that full-blown computers might just find a bit difficult. I recently saw an Apple Lisa computer in action. The operator could run a program without touching the keyboard by moving a switch around that controlled the cursor arrow which he pointed at an ideogram of what he wanted.

I thought this was clever and a grand idea. It's very easy for people to be intimidated by keyboards and to destroy data and programs by, "mucking about with the keys".

In issue No. 5 of *Bits & Bytes* I described an application that I use a 41C for almost every hour of a working week. I thought about making it user friendly and independent of the keyboard.

My program works like this. A prompt "item" asks for the input of a number corresponding to the item I want.

This is followed by an input prompt, "how many", to which I give a number that represents the quantity I want of that item.

This continues till I call a total which gives items, quantity, and cost.

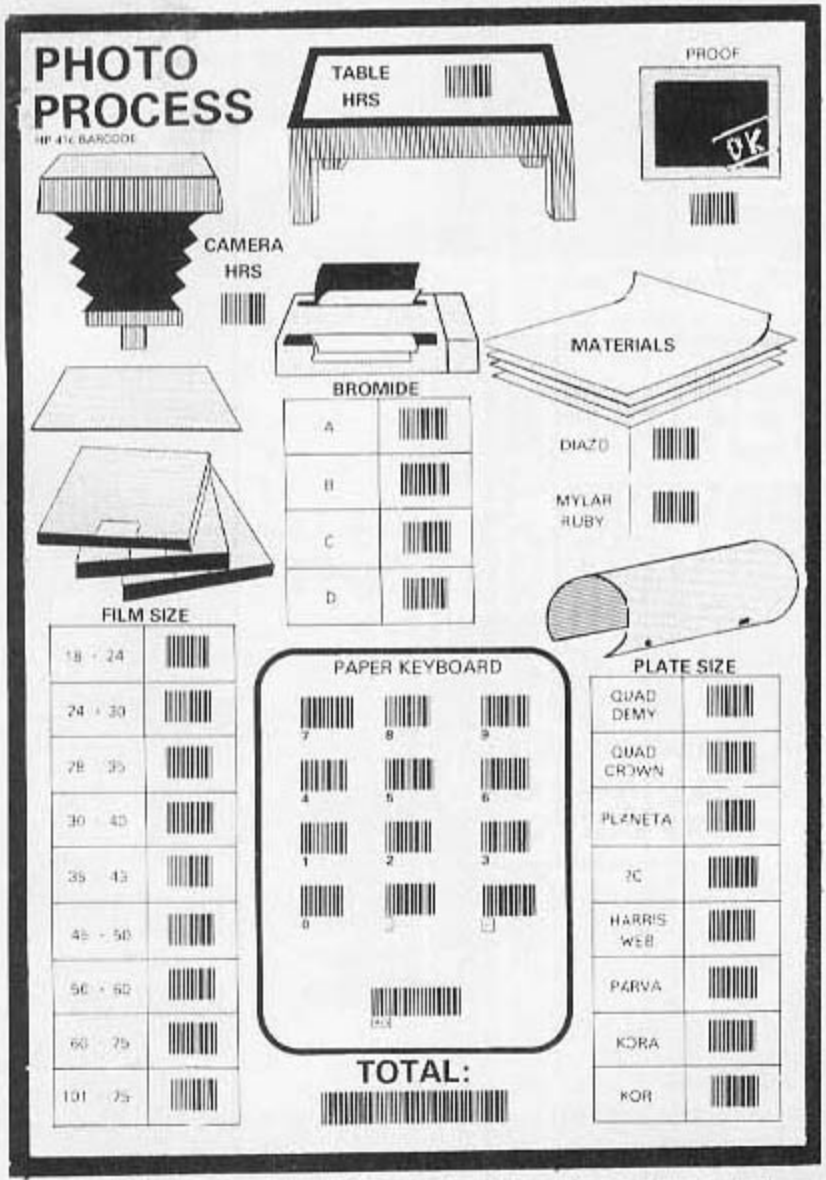
Using the stickers which have bars representing decimal numbers from 0 to 65, I started with the code for 2, placing this sticker beside an ideogram of a camera (in my program 2 represented camera-hours).

I mounted similarly all the items from 2 to 27 which made up my item list. I then mounted a paper bar-coded calculator key-pad for the input of quantity numbers. I also changed the program to allow the wand to control the 41C and operation.

Running the program is now simple. The first prompt asks for the item. All the operator has to do is a quick scan over the bar code beside the ideogram that represents the relevant item. This puts the value of the decimal coded number into the display and register 1.

A scan of 'run' and the 41C asks, "How many." The operator scans the appropriate bars on the calculator pad and run again. He continues this way until he has input all, and then scans 'Total'. After a few minutes the 41C turns off; everything is run from the wand. Nobody touches anything but the wand.

Another application is to emulate the universal product code such as you find on grocery packets. You



Bar codes, ideograms, and tables laid out together to illustrate how they might be used.

The last bug in the World

A number of people are becoming concerned about the over-reliance upon computers in nuclear weapons systems.

An organisation has been formed to collect information, educate the public and campaign for safer ways to resolve the world's problems.

If you would like to be kept informed of its activities, or would like to become involved yourself, please contact:
Computer Professionals for the Prevention of Nuclear War,
C/- Paul Bieleski, R D 1,
TE AROHA.

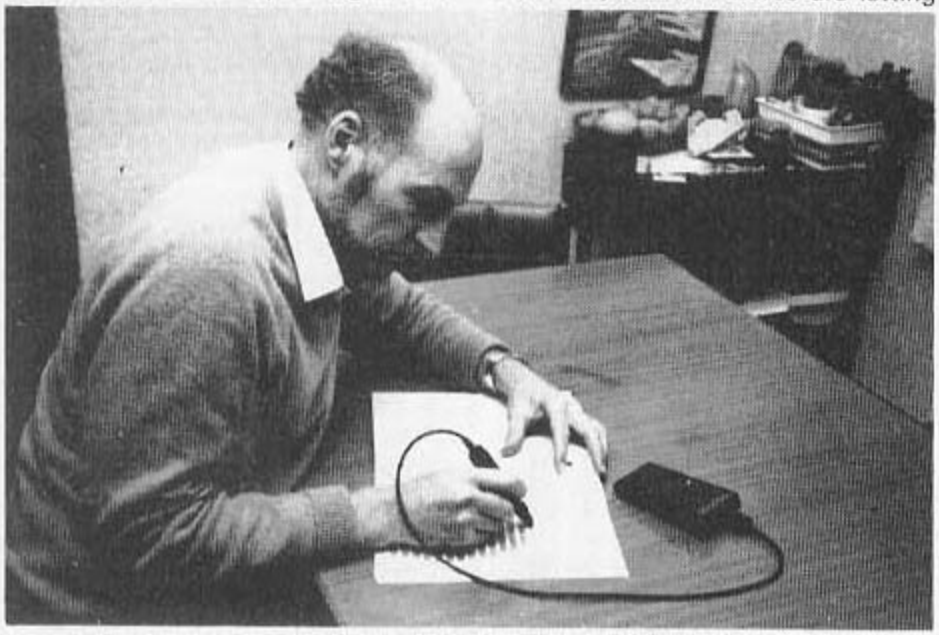
could have up to 62 items coded individually with a bar-code sticker. The price of each item in the register corresponding to the code number on that item.

A small program might be to take each item, scan the bars and then the next, and so on. Each time you scan the bars the 41C adds the value in the register corresponding to the number represented by the bars you have just scanned and adds it to a total in register 0. When you want the total, call up register 0.

It makes dispensing and charging up 60 different sizes of "Thrupple Nuts", or what have you, a dream.

The wand is capable of a great deal more than I have described here. Some important features are letting you know you have scanned correctly, testing the code for correctness, and best of all, keeping track of where you are while you're scanning pages of code.

I can only regret that all computers cannot be loaded with software as easily from such a cheap medium as printed or photo-copied listings.



Mike Thomson scans a bar code from a book; he is loading a program into the 41C.

A program listing using self-adhesive labels that are supplied with the wand.

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CALL routines save time

By BRIAN D. STRONG

"What," you may ask, "should I call my Apple?" Frankly I don't care. There are times I've called my own system some pretty horrible things, but that has nothing to do with the type of call I have in mind.

When you take your first confused steps into programming you'll start looking more closely at other program listings. Among the terms used you may come across something named CALL occurring after a line number. For example: 100 CALL -198. Then there may be others, with no indication as to what they do. Maybe you've seen them but haven't dared to try them out in case smoke comes gushing out through your keyboard.

Using CALL gives you access to machine-language routines (machine language gives me a headache, too, but this is painless). Hidden already in your machine's memory are routines that can save you a lot of time and memory space when writing a program.

Programs written in BASIC can use a lot of memory, so the more working space you can save, the more you can pack in.

Suppose you had a situation where you wanted the bell to ring, then the program to wait until the user pressed another key. There are several ways to write this, but CALL -676 is the shortest.

Another example. When the user enters incorrect data you want the screen to switch to inverse video, a message to print out, the bell to ring as an attention-getting device, then the program to wait until a key is pushed before proceeding. That part of the program could look something like this:

```
100 IFD <> 23 THEN GOTO 200
200 CALL -384
210 CALL -676
220 PRINT "INCORRECT DATA, PRESS KEY TO CONTINUE"
```

There would, of course, be more detail in the program than that, but you should have the idea how a CALL can be used by now.

Now for the pay-off for sticking this far with me. Here is a list of CALLS I assembled from a variety of sources, including the manuals, over a period of several months. Try them out in your programs and speed things up a bit.

CALL	FUNCTION
-198	Ring bell
-1216	Set GR mode
-1223	Set text
-676	Ring bell and wait for any key
-715	Wait for any key
-336	Scratch BASIC program
-151	Soft reset to Monitor
-1052	Sound bell
-958	Clear screen from cursor to bottom
-868	Clear line from cursor to right
-922	Line feed (move page up one line)
-912	Scroll up one line
-384	Set inverse video mode
-380	Resume NORMAL from FLASH or INVERSE
-307	Save on to tape
-259	Load from tape
-756	Wait for keypress
-856	Wait loop
-926	Carriage return
-980	ESC functions
-990	Perform VTAB
-1205	Set normal window
-1216	Set graphics screen
-1223	Set text screen
-1998	Clear graphics screen
-1321	Display register

Some of you may have other handy CALL routines that can be added to the list.

For users of other types of computers, these machine language routines are for the Apple only.

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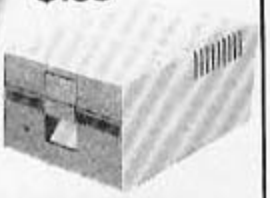

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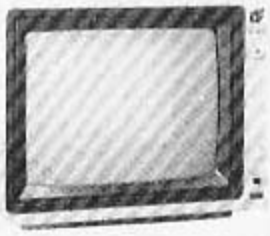

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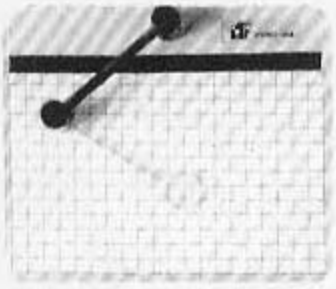

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KDA/MM

Whoopsy!

In the September edition of *Bits and Bytes* the wrong program was printed under the following introduction. Our apologies to Ken Allen.

A ZX81 enthusiast has come to our aid and will in future oversee this section for us. We hope to print more ZX81 programs and material. Contributions, suggestions, advice are welcome. Send them to "ZX81 column," *Bits & Bytes*, Box 827, Christchurch.

A byte calculator

Here's a ZX81 program that will tell you how many bytes are used by a line of program, and also allow the comparison of an alternative statement. It is written by Ken Allen, of Wellington, and his son, Nicolas, on a ZX81 with 16K RAM, but it works equally well on 1K. It can be modified provided no changes are made before line 100, and lines 2, 6, and 8 are entered exactly as shown.

```
2 REM BYTES
6 IF PEEK 16574 = 10 THEN GOTO 100
8 GOTO 200
100 IF PEEK (16578 + PEEK 16575) <> 20
THEN GOTO 200
110 PRINT "LINE 10 USES"; PEEK 16575
+4; "BYTES."
120 PRINT "LINE 20 USES"; PEEK (16579 +
PEEK 16575) +4; "BYTES."
130 PRINT
140 LIST 10
150 STOP
200 PRINT "ENTER LINES 10 AND 20, THEN
RUN —"
```

Magic square and a card game

By KEITH PAINTIN

Recently looking through a book of "magic number" games, I thought how readily they lent themselves to being programmed into a small computer.

I selected two, one the so-called magic square. The properties of this square are that adding the numbers horizontally, vertically, or diagonally always ends in the same sum. The computer version of this takes only seven lines and creates an infinite

---

Reply to correspondent Trevor Watson, the only keyboard I know of for the ZX81 available in New Zealand is the stick-on keyboard sold by Whitcoulls. However, from the content of your letter this is not what you require. I feel that your best course of action is to order a keyboard from Britain. Of the many keyboards available I know of, the dk'tronics keyboard is excellent. Another keyboard you might consider is the Fuller keyboard, available from:

Fuller Micro Systems
The ZX Centre
Sweeting Street
Liverpool 2.

Joysticks are normally priced around 30 pounds, and I feel the best one is the AGF Joystick, which mimics the cursor keys. This is available from: AGF Hardware
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— **Steven Cragg**

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variety of these squares depending on what seed number is input. It will even accept negative and decimal numbers.

The second game is a well-known card game in which you select a number between one and 60 and are then shown six cards on which there are a series of numbers. You have to identify those cards which contain your number. The trick is that the cards form a binary system, 1, 2, 4, 8, 16 and 32. All you have to do is add these numbers together for the identified cards. The computer can, of course, do this very easily and doesn't make mistakes in its arithmetic.

I think this area of ideas for programs is well worth exploring and I hope many other readers will try to do others.

Both programs were run on a ZX81 with 16K, but the first program takes only 242 bytes so will easily fit into 1K.

I have also run both programs in other BASIC's with only slight modifications for the different string handling techniques.

```
MAGIC SQUARES


      8     1     6


      3     5     7


      4     9     2

INPUT A NUMBER AND I WILL MAKE
A MAGIC SQUARE
```

```
   5 LET A=5
  10 LET B=A+A
  15 LET C=A+B
  20 PRINT AT A+C,CODE " ";" INP
UT A NUMBER AND I WILL MAKE A M
AGIC SQUARE"
  25 INPUT X
  30 CLS
  35 PRINT AT A,A;X+7;AT A,B;X;A
T A,C;X+A;AT B,A;X+2;AT B,B;X+4;
AT B,C;X+6;AT C,A;X+3;AT C,B;X+B
;AT C,C;X+1
  40 GOTO C
```

```
MAGIC NUMBER TRICK

SELECT A NUMBER BETWEEN 1 - 60

CAN YOU SEE THE NUMBER HERE?
INPUT Y OR N

32  33  34  35  36  37  38  39
40  41  42  43  44  45  46  47
48  49  50  51  52  53  54  55
56  57  58  59  60
```

```
   1 CLS
   5 LET T=0
  10 PRINT "SELECT A NUMBER BETW
EEN 1 - 60"
  15 PRINT
  20 LET T=0
  25 LET X$="32333435363738394041424344454647485051525354555657585960"
  30 GOSUB 200
  35 LET X$="16171819202122232425262728293031484950515253545556575859 60"
  40 GOSUB 200
  45 LET X$=" 8 9101112131415242526272829303140414243444546475657585960"
  50 GOSUB 200
  55 LET X$=" 4 5 6 7121314152021222324282930313637383944454647525354556560"
  60 GOSUB 200
  65 LET X$=" 2 3 6 7101114151819222326273031343536394243464750515455859"
  70 GOSUB 200
  75 LET X$=" 1 3 5 7 9111315171921232527293133353739414345474951535557591"
  80 GOSUB 200
  85 PRINT AT 10,5;"THE NUMBER I
S ";T
  90 PRINT
  95 PRINT " DO YOU WANT TO TRY
AGAIN?"
 100 INPUT R$
 105 IF R$="Y" THEN RUN
 199 STOP
 200 PRINT "CAN YOU SEE THE NUMB
ER HERE?     INPUT Y OR N"
 201 PRINT
 202 LET T=T*2
 205 FOR N=1 TO LEN X$ STEP 2
 210 PRINT X$(N TO N+1);"  ";
 215 NEXT N
 225 INPUT Q$
 230 IF Q$="Y" THEN LET T=T+1
 240 CLS
 250 RETURN
```

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Micro clubs: they're worth joining

By GORDON FINDLAY

First off, and very briefly, several people have sent me this little dodge to recover from an accidental NEW — it "sort of" restores the program:

1. POKE 17130,1
2. SYSTEM
3. /11395
4. CSAVE with whatever label you want.

Then NEW again, and CLOAD the program back. You must CSAVE, then scrub the program properly, because this "fix" doesn't really fix anything, as you will find if you try to edit the restored program. When I did, the cassette relay turned on, and the computer hung up. And a warning — this doesn't work at all with disk BASIC. Thanks to all the people who have sent this in, in one form or another, especially M. Manson, of Takaka.

There are many computer clubs in this country — just look at the list of club contacts in *Bits and Bytes*. Why belong to one? What sort of things do they do? I did a brief, unsystematic survey for you, of some of the clubs, and will report on what they told me.

I couldn't possibly write to all the clubs listed! What I did do was to write to the ones which were specifically for TRS/SYSTEM 80 users, and to a random sampling of the more general purpose clubs. Of course, not all the clubs responded in time for this article (which is being written in early August), which reduced the sample even further, so if YOUR club isn't mentioned, don't be put out. Of course, if your club is doing something which is of general interest, don't be afraid to drop me a line.

What sort of things happen at clubs? Probably the most significant is that people help each other. The point was made in several of the replies that this is a main purpose of the club. The Christchurch 80 Users Group newsletter made the point well: "To get some help, all I need to do is ask. There is always a lot of people only too willing to help others. The aim of the club is to share!!!" People in clubs are always ready to help beginners (or old hands!) with problems — no matter how trivial they may appear. And of course, when the beginner has graduated to intermediate, he or she can repay this help by helping others. The amount of assistance given free at clubs is amazing.

Another prime function of the clubs is to share software. Many programmers are very willing to give, or SWAP, their programs at the club.

Many clubs produce a regular newsletter. As well as notices of forthcoming events, they may contain a wide variety of other material. The South Canterbury Computer Users' Group produces a very nice looking newsletter, which contained a review of a new system, advice on some good buys in supplies, and discussion of the language LOGO. The Christchurch 80 Users' group had a program to transpose music, notes on some problems with commercial programs, and a cumulative record of the highest scores in a lot of games. Can YOU beat 102020 in Cosmic Fighter?

Many clubs run classes. These range from one-day crash courses in BASIC to continuing series in machine code. Other clubs have meetings which are tutorials on some special topic.

The Hawke's Bay Microcomputer Users' Group (which has alternate meetings in Napier and Hastings) has run a series of user evaluations, in which owners of various computers give a chat and a demonstration of their capabilities. Other groups — the Taranaki Microcomputer Society, the South Canterbury group among them — sometimes visit installations to see what is being done in their area.

Some other ideas at random from the clubs: rotate meetings between nights to allow people who have a regular commitment to attend at least some. I teach a night class on most Wednesdays, and by coincidence both the local clubs that I would like to attend meet on Wednesday! The Ashburton Computer Society deliberately separates formal meetings from informal/games type meetings. Other clubs organise bulk buying of tapes, disks, magazines, printers . . . The Taranaki Microcomputer Society has a kitset (based on a 6809 chip)

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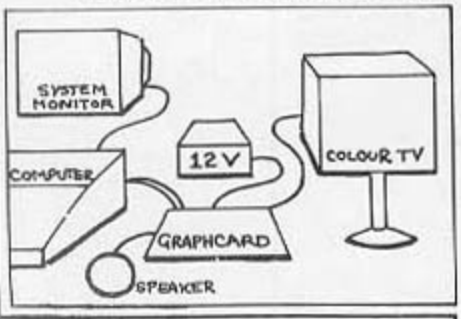

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which several members have been working on.

If you aren't already a member of a club, it's worth going along. I won't waste space by repeating the club contacts here — there is a whole page of them in the magazine already.

Thanks to the clubs who replied.

New Apple DOS

One indicator of where Apple is going in the mass market (i.e. below Lisa) may be given in the new ProDOS under development at Cupertino. Designed to handle existing Apple II DOS commands transparently the new system is more akin to an extended version of the Apple IIIs SOS. Complete with hierarchical directories the new DOS will work across a complete range of disk sizes, so standardising software and allowing easy user assimilation of new disk technology. Release is set for Spring 1984.

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basic BASIC 12
Better programs, easier life

By GORDON FINDLAY

There are a few techniques for writing programs which will make your life much easier, and make the programs much better. (A better program is one which is faster to write, contains fewer bugs, and is easier to alter than another.)

First tip: use variable names which make sense if you can. Even if you are restricted to single letter names, try to use names which correspond in some way to whatever is being manipulated. Compare these three statements:

```
X = D * V
P = H * R
PAY = HOURS * RATE
```

Which is easier to understand? The third will inevitably be easier to understand when the program needs to be fixed or modified. One-letter BASICs force the second, but there is no excuse for the first. Of course, long variable names have disadvantages: they increase the amount of typing required, and the amount of RAM (memory) used by the program; but over all the disadvantages are greatly outweighed by the advantages. Do be careful though, most BASICs only look at the first two characters of a name, so the statement:

```
ITEM1 = ITEM2 + ITEM3
```

is read as:

```
IT = IT + IT,
```

which isn't what was wanted at all!

Another useful thing to remember is that debugging a program means that you will have to read it, and that it's much easier to read spaced out programs. If your machine allows you to write programs like this:

```
FORI=1TO23STEP2:PRINTI,SQR(I):NE-
XT
```

it will save you trouble if you avoid that style, and write:

```
FOR I = 1 TO 23 STEP 2: PRINT I,
SQR(I) : NEXT
```

Again, the only disadvantage is that the spaces take up RAM, and in some machines make the program run fractionally slower. But I've tried timing, and the difference has always been less than 10 percent, so why worry about that?

The one thing which you can do in BASIC to simplify your programs is to watch your GOTO statements carefully. Too many GOTOs turn your programs into a tangle, in which changing one part of the program has drastic effects on other parts. You can reduce the number of GOTOs in several ways.

1. There is very seldom any need to have two GOTO statements in consecutive lines. This is often seen when one of the lines is an IF-THEN. If it does happen, try turning the question around:

```
230 IF X   100 THEN GOTO 250
240 GOTO 50
250 . . .
```

can be written as

```
230 IF X    = 100 THEN GOTO 50
240 . . .
```

2. Use FOR-NEXT loops whenever you can. This is always easier to read and understand than a loop made up with an IF, and one or more GOTOs.

3. If your machine allows it, use multiple statements in IF-THENs: here is an example

```
100 IF G   10 THEN GOTO 140
110 A=3
120 B=4
130 C=SQR(G)
140 . . .
```

can become:

```
100 IF G    = 10 THEN
A=3:B=4:C=SQR(G)
```

In Apple INTEGER BASIC of course this doesn't work; as only the first part (A=3) is conditional; the others are always done: but in most other machines (and in APPLESOFT BASIC) this is O.K.

4. Beware of imbedded keywords in your text. TOTAL is not a good name for a total — most BASICs will see the word TO and assume that is what is meant. Here is another: can you see the imbedded word:

```
FOR I = AP TO CO STEP BR.
```

Blanks are generally ignored, so the "CO STEP" is read as "COSTEP", with the mathematical function COS, which isn't what you meant at all!

This is the last article in the basic BASIC series. Other beginner articles will be printed, however.

Have you renewed?

If your subscription began with the November, 1982 edition of *Bits & Bytes* you should renew your sub this month. Use the card in the centre of the magazine.

Using the internal clock

By PETER ARCHER

Commodore is sometimes criticised because its version of BASIC is not a so-called "extended" BASIC, and so does not contain any key words for handling sound or graphics. Personally, I believe much of this criticism to be ill-formed, because by keeping its BASIC standard between its various models including VIC, '64, and PET it has maintained a high degree of software compatibility between these models.

Besides, not every user would want fancy commands to handle graphics and sound, and those that do can obtain an extension to their BASIC by buying an expansion cartridge. For example, the "Super-Expander" for the VIC or "Simon's BASIC" for the '64.

There is one nice feature of Commodore BASIC, however, which is not found on some competitor's machines, and that is the internal clock which is usable directly from BASIC.

Time delay

The BASIC functions, TI and TI$, have several practical uses. One is in the provision of a time delay during a program run, as an alternative to using a FOR/NEXT loop. For example, the following lines inserted in your program:

```
1000 TI$ = "000000"
1010 IF TI$ <>"000030" THEN 1010
```

will cause the computer to wait for 30 seconds before proceeding past line 1010. To change the time delay just change the "000030" to the number of seconds you require; for example "000015" will give a delay of 15 seconds, "000120" will give a delay of 120 seconds, etc. Note that TI$ *must* be six digits long; you cannot omit any of the zeros.

Line 1000 above re-sets the computer's internal real-time clock to zero, and line 1010 then holds the program execution in a loop until the condition specified is met and the program is then allowed to run on to the next line.

Screen clock

The existence of the built-in, real-time clock also means that a programmer can easily, using only ordinary BASIC programming, incorporate a time display anywhere on the screen display of any Commodore computer. Some time ago I wrote a program to utilise the VIC as a "real-time" booking recorder. The program required the computer to keep track of the time of day and to, among other things, display the time at the top-right of the screen in hours, minutes, and seconds. The following is how I achieved this:

The hours, minutes, and seconds each require two digits, with two further screer spaces to be used up by colons to separate them. For example, if the time was 10.33 a.m. and 30 seconds, the display on the top right of the screen would look like this:

10:33:30

This obviously involves reserving the eight screen character spaces on the top line of the screen at the right-hand end of the line. The best way to put the required characters onto the screen is to poke them into screen memory. As the program required more than 8K of memory expansion on the VIC, no attempt was made to write the screen clock routine to allow for the VIC screen memory being able to be in two different memory areas, as detailed in my article on VIC memory expansion in the March, 1983 *Bits & Bytes*.

On the VIC expanded by 8K or more, the top-right screen memory location is decimal 4117. On the unexpanded or 3K expanded VIC the corresponding address is 7701. This is, therefore, the address where the least significant seconds digit must be poked. Counting backwards from 4117 or 7701, you find that the tens digit of the seconds must be poked into address 4116 or 7700, the minutes digits into 4114 and 4113 or 7698 and 7697, and the hours digits into 4111 and 4110 or 7695 and 7694. The separating colon characters must be poked into addresses 4112 and 4115 or 7696 and 7699.

The necessary numbers to poke into these locations are derived by taking the ASCII values of each digit which makes up the TI$ function.

The BASIC code to do this is as follows:

```
5000 POKE 4110,ASC(LEFT$(TI$,1))
5010 POKE 4111,ASC(MID$(TI$,2,2))
5020 POKE 4113,ASC(MID$(TI$,3,1))
5030 POKE 4114,ASC(MID$(TI$,4,1))
5040 POKE 4116,ASC(MID$(TI$,5,1))
5050 POKE 4117,ASC(RIGHT$(TI$,1))
```

The BASIC to poke the two separating colons onto the screen is:

```
5060 POKE 4112,58 : POKE 4115,58
```

The other thing remaining to be done to make the clock display visible is the setting of the screen character colours. After experimenting with various colours, I decided that the following suited me best: purple for hours, red for minutes, green for seconds, and black for the colons. The following code sets this up:

```
5070 POKE 37902,4 : POKE 37903,4
5080 POKE 37905,2 : POKE 37906,2
5090 POKE 37908,5 : POKE 37909,5
5100 POKE 37904,0 : POKE 37907,0
```


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If you find that these colours do not suit you, they can be easily changed by reference to the colour code information in the VIC user manual.

If you put the above lines together into a subroutine within any VIC program with the addition of a RETURN following line 5100, every time your program calls this routine with a GOSUB 5000, you will see the current value of TI$ displayed at the top right of your screen.

There are, however, a couple of further loose ends to tie up before this will be of much practical use. These are:

Clock setting

To set the internal real-time clock, all that is required is to define TI$ as the exact correct time. This must be done whenever the computer is powered up. It can either be done on the keyboard in "direct" mode, or with a prompt from the program.

To set the computer clock to the correct time in direct mode, type on to the screen:

```
TI$ = "HHMMSS"
```

where the H's are the hours, the M's are the minutes, and the S's are the seconds. For example, if the time is just coming up to 9.41 a.m., type in:

```
TI$ = "094100"
```

and as the time reaches exactly 9.41 a.m. push "RETURN". Note that it is at the exact instant that you press the "RETURN" key that the time is set.

To set the correct time from a prompt within the program, the following routine can be used, either once at the start of a program run, or whenever required to be called as a subroutine from a menu:

```
6000 PRINT"ENTER CORRECT TIME"
6010 PRINT"FOUR DIGITS
     REPRESENTING"
6020 PRINT"HOURS AND MINUTES"
6030 PRINT
```

Turn to page 58

Programs that write themselves

By B.M. BULLEN

Now perhaps I should explain that I am not talking about programs that do away with the need for programmers. What I am talking about is programs that write, rewrite, and, if desired, re-run themselves.

I started looking at this possibility when I came across a program which used a technique called, DYNAMIC KEYBOARDING. I couldn't find much in any reference texts or magazines about it until I came across another reference to dynamic keyboarding in "COMPUTE", August, 1982. This gave me enough clues to work out how the technique works.

The technique is based on the VIC's keyboard buffer. Your VIC has a keyboard buffer that holds the CHR$ value of the last 10 keys that have been pushed. This information stays there until processed by the VIC. The normal use of this is to allow you to type faster than the VIC is using the key inputs without losing anything.

The basic idea of dynamic keyboarding is this. Your program writes on the screen the additions or alterations that are to be made. It then POKEs the right number of 13's (13 is the CHR$ value of the "return" key) into the keyboard buffer and ends. Whenever a program ends the VIC looks at the buffer to see if there are any key inputs to be processed. In this case the VIC will find the returns you POKEd there and will execute them as if you had entered them from the keyboard. This means that whatever you put on the screen will be entered in the VIC. Enough talk, let's try it out.

Enter listing 1. Run it, giving your name as input. Now list it again. Your listing should now have a line 100, which contains as data your name. Your program has just added to itself. Run it again giving different input. List it. Line 100 should have changed. Your program has just altered itself.

Now for a brief explanation of the program. The print statement in line 10 is "clear screen, cursor down, cursor down", ensuring that the printing on the screen starts below the "ready" prompt that appears when a program ends. Line 20 prints 100 DATA "your input" and then homes the cursor. Line 30 first tells the VIC there is only 1 input in the buffer (not absolutely necessary) and then POKEs a "return" in the keyboard buffer which starts at location 631.

Now for a few modifications. Remove the "home" from the end of line 20, Add 25?"GOTO 10"; "home" and alter line 30 to read 30 POKE198, 2:POKE631, 13:POKE632,13. List this and see if

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you can work out what it will do. Run it. Your program should have run, added line 100, and then rerun itself. This was done by dynamically entering the direct command GOTO 10.

Now another slightly larger example. Enter listing 3 and run it. This adds 10 data statements to itself. Check that you can follow it.

There is one problem that I have yet to mention. If you run program 12 and then type the direct command ?A$(1) you will find that nothing is printed. This is because whenever the VIC adds a new line to a program it clears out all variables. There are two ways around this problem. One is to put any variables you will need into a data statement and then read them back in. The other is to enter them using a direct command. The first method is preferable as you can only use one direct command but you can use several data statements.

Applications that I have seen of this technique have been in storing new totals every time a finance program was run and to alter a data statement in "mid flow". It could be used for many other things. One idea that came to mind was storing the position in a game if you wish to halt play and continue later, from where you left off. Be careful of using it to alter a program's logic as a "bug" could cause a lot of problems. Have fun.

Listings: p 54

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Designing your own characters

By STEVEN DARNOLD

The Commodore 64 has a wide variety of graphics modes. You can use PET graphics, sprites, multi-colour sprites, a bit map, a multi-colour bit map, programmable characters, multi-colour programmable characters or extended background colours. You can also use combinations of these modes. This rich selection of modes permits the 64 to produce extremely sophisticated graphics. However, there is a lot to learn before you can fully utilise the 64's capabilities. Programmable character definition is a good place to start.

When I am writing a program, I often find that I need a character which does not appear on the keyboard. For example, I was once working on an educational program to teach angles and I needed a degree sign. However, since I was using a PET, I had no way of producing one. The Commodore 64, on the other hand, is quite capable of producing a degree sign, or any other character which can be defined in an 8 x 8 block of dots.

The key to programmable characters on the Commodore 64 lies in the fact that any of its 256 characters can be redesigned.

This means that you can change the spade sign (for example) into a degree sign. Then every time you hit shifted-A, you get a degree sign on the screen. PRINTs and POKEs will also produce the degree sign. However, before you can redesign characters, you have to put your 64 into the right frame of mind.

First reset your 64 and remove any cartridges. Then PRINT CHR$(142); CHR$(8). This locks the computer into the upper-case/graphics character set. The lower-case/upper-case character set can also be redesigned, but it makes this discussion easier if we avoid switching character sets. Push the shift key and the Commodore key simultaneously, and you'll see that no switching occurs.

Now POKE 792,116: POKE 793,164. This alters the RESTORE routine to keep it from destroying the new characters we are going to build. Press RUN-STOP/RESTORE a few times. You should get a READY without the screen being cleared.

Now POKE 56,127 : CLR. This lowers the top of memory to give us some RAM to use. Enter PRINT FRE(0) and the result should be 30461. If it isn't then you probably forgot to enter CLR.

The next bit is the most difficult, so be careful. At present the character set is stored in ROM. To redesign the characters, we have to shift them to RAM. There are five steps: disable the interrupt; connect the ROM; transfer the characters; disconnect the ROM; and re-enable the interrupt. This must be done as one operation. Enter all of the following before pressing RETURN. To squeeze it in, it will be necessary to leave out the spaces and abbreviate POKE by P shift-O.

```
POKE 56334,0 : POKE 1,51 : FOR
T=0 TO 2047 : POKE 40960+I, PEEK
(53248+I) : NEXT : POKE 1,55 : POKE
56334,1.
```

This will take about 30 seconds to execute.

You now have a copy of the character set in RAM, but the computer is still using the set in ROM. The final step is to tell the computer to use the new character

e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc² e=mc²

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Since the screen must be in the same block of memory as the character set, it shifts at the same time. The screen now starts at 32768 (just like the PET) and the character set starts at 40960.

Clear the screen and type ABC. The characters should look normal (if not, you have a problem). Now enter POKE 40971,0. Look at the A in ABC, look at the A in READY. The zero you put in 40971 wiped out the fourth line of the A. Try putting zeros in 40972 and 40973. What happens? See if you can make all of the A disappear. Now POKE 40976,0. Can you make all of the B disappear? Can you make the C disappear, too?

Each character is made up of eight lines. Each line is stored in a separate memory location. If the contents of a memory location are zero, then the corresponding line is blank. If the contents are 255, then the line is solid (try putting 255 into 40968). Different numbers between 0 and 255 give different types of lines.

This is based on the binary representation of the number. A value of 255 gives a solid line because in binary it is 11111111. Similarly, a value of 0 is represented as 00000000. Each binary digit corresponds to a dot on the line. If the digit is 1, the dot is lit; if the digit is 0, the dot is off. Thus, if you want the left half of a line to be lit, the number to poke is 240 (=11110000). Experiment with different numbers. See pages 77-78 in the 64 User Manual for details.

The character images are arranged in order, each character taking 8 bytes. If you want to know where a particular character starts, use this formula: screen display code times 8 plus 40960. The screen display codes are listed on pages 132-134 of the User Manual. Codes for the reverse field letters run from 128 to

Turn to page 59

Yoking Z80 processor to the BBC

PIP FORER reviews the Torch Pack

This month we review a product with an interesting history and a second processor to boot. This is the Z80 Torch Pack, from Torch Computers. The pack consists of twin Mitsubishi disk drives set horizontally alongside each other, giving 800K storage for a BBC system through four 80-track disk sides.

With the unit comes a 64K second processor Zilog Z80a CPU running at 4 megaHertz. In total such a package offers a significant upgrade to any BBC system.

Feeling a little paranoic about the hands-on experience of installing certain computer peripherals at the moment, I decided that you might get a feel for this product if I first described my own encounter with its installation.

The system arrived in a cardboard carton straight from Computer Point, Christchurch, the national distributor. I opened it with a mixture of trepidation and eagerness. Waiting for me were several components. The drive itself, a sideways ROM with the cryptic letters, CPN, on top (otherwise identical to the word-processor chips mentioned last month) and a printed circuit board with a short cable. This last item is the Z80 board.

The instructions are quite clear. Remove the BBC's case and Keyboard (gulp) and insert the CPN ROM in one of the sideways ROM slots. Alas, they are already full! With great care (and much anxiety) an Econet ROM is removed and CPN inserted. Happily, no pins in the outgoing ROM are bent. Replace the covers. Next, the disk cable goes into the disk interface slot of the Beeb. At this point I am lucky to have the disk filing system already in my machine. Otherwise it would be down to the dealers to get it installed. The Torch Pack requires a 1.0 or higher operating system and a disk file server ROM to work. The dealer can supply either BBC or the enhanced PACE DFS as options with the machine at normal cost.

Finally the cable on the Z80 card goes into the "Tube" port. The manual tells me to fix the card permanently inside the BBC's case. Since the review drives must go back all too soon I leave it hanging bare by the Beeb's side.

Now comes the first hurdle. My drive has come literally straight from the air freight terminal . . . and has no power cable! To my relief my printer cable fits and I power up. A red light glows on the drive, and my Beeb now proclaims it is a Torch computer and goes into BASIC. What will a call to disks do? Placing a BBC disk in drive one and entering *CAT yields a correct directory. The system is up and running.

First impressions are that the drives are rather "clicky". The clicks reflect a design to minimise disk wear, but are a bit obtrusive. However, a hardware fix is available to provide operation in line with normal disk practices under the BBC. Apart from that the BBC drives work well.

However, this package is a little dearer than a standard disk drive and a major reason is the Z80 processor board. What will it do? With great will power I hold off experimenting until I browse the two glossy manuals with the systems, both headed Torch Computer.

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What I find is this. By entering *CPN I switch to a proprietary and compatible variant on the CP/M operating system. This accesses the Z80 processor and opens up the large library of CP/M software, including the ubiquitous Wordstar word processor. Under this system the disks, while still 80 tracks physically, operate differently with different file protocols. However, BASIC (or View) are just a command away. Furthermore, CPN feels homely since it is customised to send certain Beeb commands across to the 6502 to control output. Thus MODE for instance works as if you were in BBC.

This sounds quite idyllic and one can see how the Torch computer and the BBC are closely related machines. The Torch Pack implements CPN by using a sideways ROM and once this is accessed from the BBC it re-directs operations into the CPN firmware and operating system. This accesses the Z80 card automatically for you.

Something like the Torch Pack raises certain questions, the main one being whether the second processor is worth having for the extra cost. If you want a second processor would an Acorn one be better? The Z80 from Acorn is faster, and the 6502 more compatible. You might also worry whether with a Torch Pack you lock yourself out from either of these. The choice of processors is up to you.

However, the good news is that the Torch Pack can function independent of the Z80 card for BBC purposes. Disconnecting the card has no effect, so an alternative processor could be linked in once available and you could interchange them. If you try using CPN without the card you simply get a message "NO Z80 CARD" repeated. BREAK gets you back to BBC BASIC. The great thing about the Torch card is its availability now.

Using the Z80 capacity depends on the software you have, or will buy. For a commercial user there is a lot of available software at standard commercial prices. With the pack itself you get some demonstration programs and utilities. The utility software includes programs for transferring files both ways between BBC and CPN operating systems and a utility to transfer tape-based programs to disk. You also get a set of general-purpose software such as spreadsheet and word processor. The "Perfect" series comes free with the Torch Pack, and supplies all the main general-purpose programs a user would need. As it stands the Z80 chip offers a wide base of applications software.

Where you next look then might be to see if the precious 64K RAM could be used for storing screen images or other material from the Beeb. With a different instruction set there are limits to the direct chit-chat you might set up between the two processors, but Torch describes and carefully documents routines for byte transfer between the Z80 and the BBC. Can we easily implement fast storage the other way, say of a 20K screen image? Three of those recallable at speed would be worth the effort. That question has yet to be fully answered.

One final comment on documentation. The assembly instructions are good, as are the manuals on the Torch computer insofar as it relates to the Torch Pack itself. It would have been nice, however, to have a small volume on using the Torch Pack as the Torch Pack, for instance detailing the utilities provided that are specific to the pack's use as a BBC peripheral, including disk instructions and the question of BBC to Z80 communication. I gather this is in hand.

The product is well engineered and well supported. Apart from the click of the drives it is a pleasure to use. Where careful thought for the purchaser is necesary is in the area of the second processor. You can get one now . . . but is it right for your needs?

You will probably save a little by going the Torch way, but this path is most attractive to a BBC user who also wants to use established CP/M programs, Torch's business software or the version of Farm Plan which uses the capabilities of the BBC screen.

For the hobbyist, the value of the Torch Pack hangs on just what he or she can do with the Z80. Small business owners or farmers wanting access to business software and a good home/educational software base from the same machine seem the obvious immediate users.

The Torch Pack retails at $2995. The review pack was supplied by Computer Point, Christchurch.

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Used Apples

Schools upgrading to the Apple IIe computer have created a market for Apple II computers at heavily reduced prices.

The current going rate for these Apple II's seems to be around $2500 for either 64K or 48K plus disk drive and green monitor. This compares with a new price for the same configuration of $4765.

Several dealers have these Apple II's available (watch for the adds in *Bits & Bytes*) but they give warning that the supply is not endless.

ZX81

Errors in listing

The listing of the ZX-81 Calculator program printed in the August issue of *Bits & Bytes* contained several errors that would cause serious problems to anyone trying to run the program as it stands. Two of these were due to, ah, my printer making a mistake, while the editor has generously agreed to share the honours for the remainder. Below is a list of the correct version of those lines that were in error:

```
10 DIM R(10)
50 PRINT AT . . . ;3,0;"X ";X
120 IF F$(1) = "S" THEN GOTO 600
250 IF L> 20 THEN GOTO 1000
310 LET P$ = F$(Z(K-1) + 1 TO Z(K) - 1 +
(K = L))
1000 PRINT AT 17,0;S$ + S$; AT 17,0;
"[STACK FULL]"
```

Note particularly the presence of the conditional expression (K = L) in line 310. Note also that character strings enclosed in square brackets are typed in graphics mode i.e. inverse video.

A further useful change is: delete line 355, then insert

```
575 SLOW
```

This has the effect of giving rather more consistent behaviour when the program is running in FAST mode.

— R.J. Sparks

Sorry, ZX81 users. We have trouble reprinting programs because our typesetter's modern plant does not have all the symbols used in programs of the various machines. Our make-up artists then do their best, but sometimes slip up. We are looking for ways round the problem.

— The Editor.

VIC

From page 50

LISTING 1

```
10 INPUT A$:PRINT"▒▒▒"
20 PRINT100;"DATA ";A$;"▒"
30 POKE198,1:POKE631,13
```

LISTING 2

```
10 INPUT A$:PRINT"▒▒▒"
20 PRINT100;"DATA ";A$
25 PRINT"GOTO10";"▒"
30 POKE198,2:POKE631,13:
   POKE632,13
```

LISTING 3

```
10 FORC=0TO9
20 PRINT"ENTER NAME ";C
30 INPUT A$(C)
40 NEXT
50 PRINT"▒▒▒"
60 FORC=0TO9
70 PRINT220+C;"DATA ";A$(C)
80 NEXT
90 PRINT"▒"
100 POKE198,10
110 FORC=0TO9
120 POKE631+C,13
130 NEXT
```


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Genuinely for the beginner

"Microcomputers in Plain English for New Zealanders" by Brian Strong. Published by Reed Books. 112 p Price: $7.95. Reviewed by Gerrit Bahlman.

The perennial problem for everyone with expertise in computing is the beginner who is utterly lost. Often those people have committed themselves to a machine, parted with the requisite funds for a home computer of one kind or another, then discovered they really haven't a clue.

The reason why it is a problem for the experienced user is not based on arrogance or intolerance, but simply on an awareness there is one hell of a lot to learn and a poor introduction to the wonders of computing can turn someone off for life.

To illustrate the point, I'd like to recount a visit to a fish and chip shop. Next door to the "restaurant" was a dairy, the natural watering place.

Dad was sent inside with the requisite list of instructions. The proprietor was perched behind a small home computer. He had embarked on the road to computer literacy without hesitation. The sales people had convinced him this "under $1000" machine would solve all his stock keeping problems and do his accounts as well. Software was in plentiful supply although not available quite yet.

When I walked in, he was trying to sort out the single software package that had finally arrived. It was going to do some simple accounts for him! Unfortunately, it didn't seem to work. Why not? Something about V.A.T. I was told.

This courageous individual had bought a tape-based home computer, software utterly inappropriate to his needs, and believed the machine could be made to serve him effectively.

The tragedy of this situation is that the looming disappointment could turn him from the technology permanently. Now some cynical unsympathetic types may argue the fault lies with the buyer. You can't expect something for nothing yet that is precisely what many computer purchasers do expect.

There may be some truth in this but I believe the principal problem is simply one of ignorance. There is a genuine need for computerese to be simplified. Books, magazines, information outlets must be produced which will simplify what must be known.

I believe Brian Strong's book is attempting to meet that need. In his introduction, he warns the experienced user to go and read something else. This book is for the complete novice.

Written with the New Zealander in mind, it is broken into 11 chapters which range over the history, jargon, peripherals (add-ons), uses, languages, programming and methods of choosing computers.

It is full of simple solid advice: What are you going to use the blessed thing for? If you can't answer that then don't buy one. He makes an effort to cover the range of uses, listing business, farming, teaching, laboratory and home applications that are very much the standard fare-well tried and of proven worth.

The book does not try to provide in-depth knowledge, just an overview of the current stage of the technology. What are things called and in a simple way, what do they do.

As one of the people who isn't allowed to read the book I still managed to enjoy it. Certainly, there are some sticky aspects of content I would have liked to have seen treated in a different way but this would do the intent of the book an injustice.

The important point is the book is genuinely for the beginner and a sincere effort is made to provide the reader with information sources that will allow extension.

If the man in the dairy had had this book on his bookshelf before buying his home computer, he may have saved himself a great deal of trouble.

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Salvation for the slow and clumsy

"Quick Keyboarding". By Vonnie Alexander. Plublished by Methuen New Zealand, 1983. $6.95. 18pp with reference chart. Soft cover.

"Keyboarding for Information Processing". By Robert Hanson and Sue Rigby. Published by Osborne/McGraw-Hill, 1981. 110pp. Soft cover, spiral bound. Reviewed by Warren Marett.

BOOKS

For us slow and clumsy keyboarders, salvation can be found in one of these two inexpensive books.

"Quick Keyboarding", a New Zealand effort, offers "competent keyboarding in six hours". The learner is guided through six one-hour lessons which the book recommends be done on consecutive days.

Unlike most typing courses, "Quick Keyboarding" teaches the keys not by starting with the home keys and then moving outwards, but by progressing sequentially through the letters of the alphabet.

The author, Vonnie Alexander, from Loburn, in Canterbury, believes the justifications for the traditional method have disappeared with electric and electronic keyboards.

This is a book of few words that should suit people wanting a quick path to mastering the keyboard. Self-control will be needed after the six-hour course is finished to avoid slipping back into two finger mode.

A wall chart is included to remind the reader of the correct fingering.

By contrast, "Keyboarding for Information Processing" teaches by the traditional method and is more demanding, exacting and rigorous.

It aims to get its message across by repetitious exercises, and emphasises accuracy and attainment of speed on each letter before passing on to the next letter.

As a minor bonus, it is oriented towards word processing and computer keyboarding.

"Keyboarding for Information Processing" is presented in a spiral-bound, compact format.

Choose the first book if you are an occasional keyboarder who wants a quick way to get your fingers on the right keys. Choose the second if you are regularly using a keyboard and have the patience to practise the book's drills.

Projects with the Apple

"The Apple Connection." By James W. Coffron. Published by SYBEX, 263pp. $22.95. Reviewed by Mike Wall.

Most Apple users have had very little to do with connecting anything to their machines apart from a disk drive or printer. The sight of all those chips is an enormous psychological barrier to grabbing a soldering iron and "having a go."

This book may be about to change all that. It assumes that a reader is unaware of the existence of PEEK and POKE and starts from there. All project software is written in BASIC with outstanding internal documentation.

On the electrical front, all circuits are explained fully with uncluttered circuit diagrams, plenty of comments, and all appropriate pin in/out numbering.

The content covers 8-bit digital data, PEEK and POKE, simple input/output hardware,

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CLUB CONTACTS

BBC MICROCOMPUTER USERS GROUP OF NZ, P.O. Box 9592, Wellington. Local meetings — Auckland: 2nd Wednesday of the month at VHF Clubrooms, Hazel Ave, Mt Roskill. Ph: Dave Fielder 770-630 ext 518 (h). Wellington: 4th Thursday of the month at the Correspondence School staffroom, 1st floor, Portland Cres, Thorndon, 7.30pm. Ph: Anton, 286-289.

SERADO & HART APPLE COMPUTER CLUB, Kerikeri High School, Kerikeri. Lessons, 12:15 to 1:15 weekly. Contact: S. Shearman 79-882 (Kerikeri) or Fairway Drive, Kerikeri.

WHANGAREI COMPUTER GROUP: Tom Allan, 3 Maunu Rd, Whangarei. Phone 83-063 (w). Meets every second Wednesday of the month at Northland Community College.

NZ MICROCOMPUTER CLUB INC: P.O. Box 6210, Auckland. The monthly Meeting is held on the first Wednesday of each month at the OSNZ Hall, 107 Hillsborough Rd, Mt Roskill, from 7.30pm. Visitors are also welcome to the computer workshop in the hall, 10am-5pm, on the Saturday following the above meeting.

The following user groups are part of the club. All meetings shown start 7.30pm at the VHF Clubroom, Hazel Ave, Mt Roskill. They can all be contacted at club meetings or via NZ microcomputer Club, P.O. Box 6210, Auckland.

APPLE USERS' GROUP: Don Hagen, 70 Hapua Street, Remuera; 546-748 (h) 547-180 (w). Meetings, first Tuesday each month.

BBC USERS' GROUP: Dave Fielder. Phone 770-630 ext 518 (w). Meetings, second Wednesday of month.

BIG BOARD USER GROUP: Steve Van Veen, Flat 5, 111 Melrose Rd, Mt Roskill, Auckland 4. Phone (09) 659-991 (h).

BUSINESS USERS' GROUP: John Hawthorn, 11 Seaview Rd, Remuera. Phone 542-714 (h), 876-189 (w). Meetings monthly.

COMMODORE USERS' GROUP: John Walker, 833-9589 (day). Box 5233 Auckland. Meetings 3rd Wednesday, Remuera Primary School Hall, Dromorne Road.

CP/M USERS' GROUP: Kerry Kappert, 2/870 Dominion Rd., Balmoral. Phone 69-5365 (h). Meetings: Micro workshop.

IBM PC USERS' GROUP: Terry Bowden, 452-639 (h.) 778-910 (w.). Box 6210, Auckland.

NZ OSBORNE USERS' GROUP: Brian Jones, 659-738 (h.) Box 6210, Auckland.

SINCLAIR USERS' GROUP: Doug Farmer. Phone 567-589 (h). Meetings: Fourth Wednesday.

SORCERER USERS' GROUP (NZ): Selwyn Arrow. Phone 491-012 (h). Meetings: Micro workshop.

SORD USERS' GROUP: Graeme Hall, 5 Brouder Place, Manurewa (266-8133) (h).

TI 99/4A USERS' GROUP: Ray Tucker, 568-195 CW, 63 Maniot Rd, Pakuranga.

WIZZARD USERS' GROUP: Richard McFadgen (GN8218(Ch), 784580 (w), 11 Hilling St, Tauranga.

2650 USERS' GROUP: Trevor Sheffield 676-591 (h).

1802 USERS' GROUP: Brian Conquer. Phone 855-984 (h).

The above contacts can usually be found at NZ Microcomputer Club Meetings, or via P.O. Box 6210, Auckland.

Other Auckland-based groups:

ACES (Auckland Computer Education Society): C/- Director, Computer Centre, Secondary Teachers' College, Private Bag, Symonds Street, Auckland. Meetings: third Wednesday of month, at the College.

ATARI MICROCOMPUTER USERS GROUP: Brian or Bean Yakas. Phone 8383 060 (h). Meetings: Second Tuesday.

BBC Club: See entry at head of this list.

CMUG (Combined Microcomputer Users' Group): This is an association of Microcomputer Clubs, Groups, etc, formed to co-ordinate activities and to give a combined voice on topics concerning all micro users. Representation from all Clubs and Groups is welcomed to: CMUG C/- P.O. Box 6210, Auckland.

EPSON HX20 USERS' GROUP: Contact: C.W. Nighy, 231 Khyber Pass Road, Auckland, (Ansaphone, 774-268).

HP41C USERS' GROUP (Auckland): C/- Calculator Centre, P.O. Box 6044, Auckland: Grant Buchanan, 790-328 (w). Meets third Wednesday, 7pm, at Centre Computers, Great South Rd., Epsom.

NZ TRS-80 MICROCOMPUTER CLUB: Olaf Skarsholt, 203A Godley Rd., Titirangi. Phone 817-8696 (h). Meets first Tuesday OSNZ Hall, 107 Hillsborough Rd, Mt Roskill.

OSI/BBC USERS' GROUP (Ak): Secretary: Ken Harley, 77 Boundary Road, Auckland. Meets third Tuesday, VHF Clubrooms, Hazel Ave., Mt Roskill.

SYMPOOL (NZ SYM USER GROUP): Mark Bennett, P.O. Box 651, Manurewa. Ph 541-043 (w).

A.Z.T.E.C.: Brian Mayo, Church Street, Katikati. Phone 490-328. Members use all micros.

BAY MICROCOMPUTER CLUB (Tauranga): C. Ward, Secretary, P.O. Box 6037, Brookfield, Tauranga. Phone: 89-234.

BAY OF PLENTY COMMODORE COMPUTER CLUB: D.J. McVay, of 40 Esk Street, Tauranga.

BEACH COMPUTING CLUB (Waihi): Jamie Clarke Box 132, Waihi (Ph: 45-364 Waihi Beach).

ATARI 400/800 USER CLUB: Dave Brown, P.O. Box 6053, Hamilton. Phone (071) 54-692 (h).

HAMILTON SUPER 80 USERS': Bruce White, (h). 436-878.

WAIKATO COMMODORE USERS' GROUP: Secretary, Mrs Eileen Woodhouse, 32 Kenny Crescent, Hamilton.

MORRINSVILLE COMPUTER SOCIETY: Contact: Alison Stenyer, 48 Coronation Road, Morrinsville. Phone 6695 (h). Meets 1st and 3rd Wednesdays.

GISBORNE MICROPROCESSOR USERS' GROUP: Stuart Mullett-Merrick, P.O. Box 486, Gisborne. Phone 88-826.

ROTORUA COMPUTER CLUB: Contact: Ken Blackman, 6 Urquhart Place, Rotorua. Third Tuesday of each month at 7pm, Wzianki Community College, Rotorua.

ELECTRIC APPLE USERS' GROUP: Noel Bridgeman, P.O. Box 3105, Fitzroy, New Plymouth. Phone 80-216.

TARANAKI MICRO COMPUTER SOCIETY: P.O. Box 2003, Bell Block, New Plymouth. Mr K. Smith. Phone 8556, Waitara.

HAWKE'S BAY MICROCOMPUTER USERS' GROUP: Bob Brady, Primal Pharmacy, Primal Plaza, Napier. Phone 439-016.

MOTOROLA USER GROUP: Harry Wiggins, (ZL2BFR), P.O. Box 1718, Palmerston North. Phone (063) 82-527 (h).

HOROWHENUA MICROCOMPUTER CLUB: Meets on second and fourth Thursday of month. President, Wally Witbell, P.O. Box 405, Levin; secretary, Dennis Cole, 28 Edinburgh Street, Levin. Ph (069) 83-904.

WAIRARAPA MICROCOMPUTER USERS' GROUP: David Cameron, 64 Herbert St, Masterton. Phone 86-176.

CENTRAL DISTRICTS COMPUTERS IN EDUCATION SOCIETY: Rory Butler, 4 John Street, Levin. (069) 84-466 or Margaret Morgan, 18 Standen Street, Kaitoi, Wellington. (04) 767-167.

UPPER HUTT COMPUTER CLUB: Shane Doyle, 18 Holdworth Avenue, Upper Hutt. Phone 278-545. An all-machine club.

BBC USER GROUP: Users of other machines welcome too. Write P.O. Box 1581, Wellington, or Phone 861-213, Wellington.

BBC Club: See entry at head of this list.

MICROBEE USERS' CLUB: P.O. Box 871, Wellington. 2nd Sunday of month.

NEC COMPUTER USERS' GROUP: C/- P.O. Box 3820, Wellington.

N.Z. SINCLAIR USERS' GROUP: P.E. McCarroll, 11 Miro Street, Lower Hutt.

NZ SUPER 80 USERS' GROUP: C/- Peanut Computers, 5 Dundee Pl., Chartwell, Wellington 4. Phone 791-172.

OHIO USERS' GROUP, Welington. Secretary/Treasurer: R.N. Hiskip, 65B Awatea Street, Porirua.

ATARI USERS' GROUP, Wellington: Eddie Nickless. Phone 731-024 (w), P.O. Box 18011. Meetings: first Wednesday of month.

WELLINGTON MICROCOMPUTING SOCIETY INC.: P.O. Box 1581, Wellington, or Bill Parkin (h) 725-086. Meetings are held in Wang's Building, 203-209 Willis Street, on the 2nd Tuesday each month at 7.30pm.

WELLINGTON SYSTEM 80 USERS' GROUP: Contact: M. Trickett. Phone: 724-351 (w), 662-747 (h).

NELSON MICROCOMPUTER CLUB: Dr Chris Feltham, Marsden Valley Rd, Nelson. Phone (054) 73-300 (h).

NELSON VIC USERS' GROUP: Peter Archer, P.O. Box 860, Nelson. Phone (054) 79-362 (h).

BLENHEIM COMPUTER CLUB: Club night second Wednesday of month. Ivan Meynell, Secretary, P.O. Box 888. Phone (h) 85-207 or (w) 87-834.

CANTERBURY COMPUTER EDUCATION SOCIETY: Secretary, Nail Fleming, 798-800, Box 2812, Christchurch.

CHRISTCHURCH ATARI USERS GROUP: Contact Edwin Brandt. Phone 228-222 (h), 793-428 (w).

CHRISTCHURCH '80 USERS' GROUP: David Smith, P.O. Box 4116, Christchurch. Phone 63-111 (h).

CHRISTCHURCH PEGASUS USERS' GROUP: Don Smith, 53 Farquhars Rd, Redwood, Christchurch. Phone (03) 526-994 (h), 84-544 (w), ZL3AFP.

CHRISTCHURCH APPLE USERS' GROUP: Paul Neidorer, C/- P.O. Box 1472, Christchurch. Phone 796-100 (w).

OSI USERS' GROUP (CH): Barry Long, 377 Barrington St., Spreydon, Christchurch. Phone 384-560 (h).

CHRISTCHURCH ATARI USERS' GROUP: Edwin Brandt, 61 Ensign Street, Christchurch 3. Phone 228-222.

CHRISTCHURCH SINCLAIR USERS' GROUP: Mr J. Mitchell. Phone 385-141, P.O. Box 33-098.

CHRISTCHURCH COMMODORE USERS GROUP: John Kramer, 885-533 and John Sparrow. Phone 896-699.

ASHBURTON COMPUTER SOCIETY: Mr J. Clark, 52 Bucefield Avenue.

SOUTH CANTERBURY COMPUTERS GROUP: Caters for all machines for ZX81 to IBM34. Geoff McCaughan. Phone Timaru 84-200 or P.O. Box 73.

NORTH OTAGO COMPUTER CLUB: Contact: Peter George, P.O. Box 281, Oamaru. Phone 29-106 (h) 70-646 (h).

LEADING EDGE HOME COMPUTER CLUB: Elaine Orr, Leading Edge Computers, P.O. Box 2260, Dunedin. Phone 55-268 (w).

DUNEDIN SORD USERS' GROUP: Terry Shand. Phone (024) 771-295 (w), 881-432 (h).

CENTRAL CITY COMPUTER INTEREST GROUP: Robert Edgelet, Eclipse Radio and Computers, Box 5260, Dunedin. Phone 778-102. Meetings every second Tuesday.

OTAGO COMPUTER EDUCATION SOCIETY C/- Peter Brook Otago Girls' High School, Dunedin.

SOUTHLAND COMMODORE USER GROUP: (VIC 20 and 64s). Address: C/- Office Equipment Southland, Box 1079, Invercargill.

NOTE: Clubs would appreciate a stamped self-addressed envelope with any written inquiry to them.

NOTE: If your club or group is not listed, drop a line with the details to: Club Contacts, BITS & BYTES, Box 827, Christchurch. The deadline for additions and alterations is the first weekend of the month before the next issue.

From page 49

```
6040 PRINT"(24 HOUR MODE PLEASE)"
6050 PRINT"AND PRESS 'RETURN' "
6060 PRINT"AT CORRECT INSTANT."
6070 PRINT
6080 INPUT Z$
6090 IF LEN(Z$)<>4 THEN 6080
6100 TI$ = Z$ + "00"
```

I will leave you to tidy up the screen format to your own taste by clearing the screen at the start of the routine, possibly throwing in a few colours, etc.

Updating display

The routines I have described so far allow for the correct setting of your screen clock and for it to be displayed. But the time changes every second, so we require some way to call the routine starting at line 5000 at least once every second.

The way that I usually achieve this is by inserting a gosub to the updating routine in the middle of every "GET" loop in the program. For example, everytime you have the computer await the press of a keyboard key which you would normally do with a variation of the following:

```
2000 GET A$ : IF A$ = "" THEN 2000
```

modify this to:

```
2000 GET A$ : IF A$ = "" THEN GOSUB 5000 : GOTO 2000
```

This means that whenever the computer is awaiting an input from the keyboard, it is also busily updating the screen clock display. You can even insert an alarm function into the program by calling up an alarm subroutine immediately after every "gosub 5000" and comparing the new value of TI$ with a value of an alarm time string which you can define in another part of the program. But I will leave you to figure that one out for yourself.

If your VIC does not have 8K or more memory expansion, the screen and colour pokes will have to be changed as follows:

4110 becomes 7694	37902 becomes 38414
4111 becomes 7695	37903 becomes 38415
4112 becomes 7696	37904 becomes 38416
4113 becomes 7697	37905 becomes 38417
4114 becomes 7698	37906 becomes 38418
4115 becomes 7699	37907 becomes 38419
4116 becomes 7700	37908 becomes 38420
4117 becomes 7701	37909 becomes 38421

Note: for a detailed explanation of how VIC configures its screen and colour memory, see my article in the March *Bits & Bytes*. Also for some more detail on routines for "GETing" a character from the keyboard, see my article in the August *Bits & Bytes*.

GLOSSARY

Algorithm: A list of instructions for carrying out some process step by step.

Applications program: A program written to carry out a specific job, for example an accounting or word processing program.

Array: A data type found in high level languages, which is stored in a contiguous block of memory. Accessed by the array name and an index making it easier to process groups of data in many situations.

BASIC: Beginners' All-purpose Symbolic Instruction Code. The most widely used, and easiest to learn, high level programming language for microcomputers.

Baud: Speed of transferring data, measured in bits per second.

Binary: The system of counting in 1's and 0's used by all digital computers. The 1's and 0's are represented in the computer by electrical pulses, either on or off.

Bit: Binary digit. Each bit represents a character in a binary number, that is either a 1 or 0. The number 2 equals 10 in binary and is two bits.

Boot: To load the operating system into the computer from a disk or tape. Usually one of the first steps in preparing the computer for use.

Buffer: An area of memory used for temporary storage while transferring data to or from a peripheral such as a printer or a disk drive.

Bug: An error in a program.

Byte: Eight bits. A letter or number is usually represented in a computer by a series of eight bits called a byte and the computer handles these as one unit or "word".

CAD/CAM: Computer-aided design and Computer-aided manufacture. A burgeoning field of computing, marks on mini's, that allows design on-line, and the use of co-ordinates, etc, from designers to be used in manufacturing.

CAL: Computer Aided Learning CAL programs are written to take different actions on different student answers.

CMOS: Chip technology in which a pair of transistors of opposite type are used together.

Computer language: Any group of letters, numbers, symbols and punctuation marks that enable a user to instruct or communicate with a computer. See also Programming languages and Machine language.

Courseware: Name for computer programs used in teaching applications.

Cpi: Means character per inch. A common way of describing character density, i.e., how close together characters are in printers.

CP/M: An operating system for Z80 based machines. It is by far the most widely used DOS for Z80 based machines and there is an extremely large software base for it. See also disk operating systems.

cps: Characters per second. A common way of describing speed in printers.

Cursor: A mark on a video that indicates where the next character will be shown, or where a change can next be made.

Data: Any information used by the computer either I/O or internal information. All internal information is represented in binary.

Disk: A flat, circular magnetic surface on which the computer can store and retrieve data and programs. A flexible or floppy disk is a single 8 inch or 5¼ inch disk of flexible plastic enclosed in an envelope. A hard disk is an assembly of several discs of hard plastic material, mounted one above another on the same spindle. The hard disk holds up to hundreds of millions of bytes – while floppy disks typically hold between 140,000 and three million bytes.

Disk drive: The mechanical device which rotates the disk and positions the read/write head so information can be retrieved or sent to the disk by the computer.

Diskette: Another name for a 5¼ inch floppy disk.

Disk operating system: A set of programs that operate and control one or more disk drives. See CP/M for one example. Other examples are TRSDOS (on TRS 80) and DOS 3.3 (for Apples).

DOS: See disk operating system.

Dot matrix: A type of print head, made up of a matrix of pins, e.g. 8x8. When a character is to be printed the appropriate pins push out and strike the ribbon to paper forming the character.

Dot graphics: These graphics are individual screen pixels. Used by either turning on or off one pixel.

Double-density: Floppy drives that store twice the standard amount of data in the same space. This has been made possible by advance in the medium and the drives.

Dump: Popular term for sending data from a computer to a mass storage device such as disks or tape.

EPROM: Erasable, user-programmable, read-only memory.

Ergonomics: The study of the relationship between workers and their environment.

Execute: A command that tells a computer to carry out a user's instructions or program.

Fanfold: A type of paper that although a continuous sheet folds into set length sheets. This is achieved by way of a perforated line at set intervals. It also makes its easy to tear off a length of paper.

File: A continuous collection of characters (or bytes) that the user considers a unit (for example on accounts receivable file), stored on a tape or disk for later use.

Firmware: Programs fixed in a computer's ROM (Read Only Memory); as compared to software, programs held outside the computer.

Floppies: Thin plastic disks with a magnetic coating used for storing information. Called floppies because they are flexible.

Friction feed: A type of paper-feeding system for printers: normal paper in a continuous sheet is gripped between two friction rollers as on a typewriter.

Hardware: The computer itself and peripheral machines for storing, reading in and printing out information.

Hex: Abbreviation for hexadecimal notation, a base-16 numbering system convenient to use with computers.

High-level language: Any Englishlike language, such as BASIC, that provides easier use for untrained programmers. There are now many such languages and dialects of the same language (for example MicroBASIC, PolyBASIC etc).

HIMEM: Denotes the highest address that is available in a memory map.

Input: Any kind of information that one enters into a computer.

Interactive: Refers to the "conversation" or communication between a computer and the operator.

Interface: Any hardware/software system that links a microcomputer and any other device.

I/O "Input/output".

Inverse video: When the background is coloured; e.g. on a black and white screen white becomes background and characters are written in black.

K: The number 1024. Commonly refers to 1024 bytes. Main exception is capacity of individual chips, where K means 1024 bits.

KILOBYTE (or K): Represents 1024 bytes. For example 5K is 5120 bytes (5 x 1024).

Line feed: A control code character found in the ASCII character set. Its normal purpose is to move the cursor down one line (on screen) or move paper up one line (on printer). Does not return the cursor to the left-hand margin.

Machine language: The binary code language that a computer can directly "understand".

Mainframe: The very large computers that banks and other large businesses use are called mainframes. Also in microcomputers the term is sometimes used to describe the core of the machine, i.e. the CPU plus memory.

Mass storage: A place in which large amounts of information are stored, such as a cassette tape or floppy disk.

Megabyte (or Mb): Represents a million bytes.

Memory: The part of the microcomputer that stores information and instructions. Each piece of information or instruction has a unique location assigned to it within a memory. There is internal memory inside the microcomputer itself, and external memory stored on a peripheral device such as disks or tape.

Memory capacity: Amount of available storage space, in Kbytes.

Menu: List of options within a program that allows the operator to choose which part to interact with (see interactive). The options are displayed on a screen and the operator chooses one. Menus allow user to easily and quickly set into programs without knowing any technical methods.

Microcomputer: A small computer based on a microprocessor.

Microprocessor: The central processing unit or "intelligent" part of a microcomputer. It is contained on a single chip of silicon and controls all the functions and calculations.

Modem: Modulator-demodulator. An instrument that connects a microcomputer to a telephone and allows it to communicate with another computer over the telephone lines.

Network: An interconnected group of computers or terminals linked together for specific communications.

Output: The information a computer displays, prints or transmits after it has processed the input. See input and I/O.

Parallel interface: A type of communications interface used mostly for printers. It sends a whole character of data down eight (commonly) lines, one bit down each line. The most common type of parallel interface for printers is the centronics interface.

Pascal: A high-level language that may eventually rival BASIC in popularity.

PEEK: A command that examines a specific memory location and gives the operator the value there.

Peripherals: All external input or output devices: printer, terminal, drives etc.

Pixel: Picture element. The point on a screen in graphics.

POKE: A command that inserts a value into a specific memory location.

Program: A set or collection of instructions written in a particular programming language that causes a computer to carry out or execute a given operation.

RAM: Random access memory is the very fast memory inside your computer. The access time for any piece is the same. Your program and run-time data are usually stored in RAM.

REM statement: A remark statement in BASIC. It serves as a memo to programmers, and plays no part in the running program.

Resolution: A measure of the number of points (pixels) on a computer screen.

ROM: Read only memory. Any memory in which information or instructions have been permanently fixed.

Serial interface: A type of communications interface used for a wide variety of purposes (printers, terminals, telephone correction etc.). It uses a minimum of two wires, and sends the data one bit at a time down one wire. The most common type of serial interface is RS232C.

Sheet feed: A type of paper feeding system normally used for high-quality document printers. A special device picks up a sheet of paper and feeds it into friction rollers.

Simulation: Creation of a mathematical model on computers that reflects a realistic system.

Software: Any programs used to operate a computer.

System: A collection of hardware and software where the whole is greater that the sum of the parts.

Tractor feed: A type of paper feeding system for printers. Special computer paper with holes along both sides is fed by the tractors gripping these holes.

VDU: Visual display unit. A device that shows computer output on a television screen.

Word: A group of bits that are processed together by the computer. Most microcomputers use eight or 16 bit words.

From page 52

255. Thus, although we have mangled A, B, C (codes 1, 2, 3), we have not touched their reverse field representations (codes 129, 130, 131). Check this by pressing CTRL/RVS-ON and typing ABC.

Now we are ready to turn the spade sign into a degree sign. First look up the code for spade (=65), multiply it by 8 (=520), and add 40960 (=41480). This gives us the first line of the spade. POKE 120 (=01111000) into 41480 and 41483. POKE 204 (=11001100) into 41481 and 41482. POKE 0 into the bottom three lines (41484-41486). Now press shifted-A for a lovely degree sign.

That's all there is to it. Now you can design your own characters. You'll have to spend a bit of time with an 8 x 8 grid working out the numbers, but once you get used to it, it isn't too difficult.

CLASSIFIEDS

Machine Code book for ZX81. Ideal for beginners or advanced programmers. $19.95. Computer World Software, P.O. Box 2722, Christchurch.

Vic 20, datacassette (slight damage), Manual, Programmers Ref. Guide, game cartridge, tape games. $650. V. Parker, 6 Thames Road, Paeroa.

Lobo Max — 80 : TRS-80 and CP/M Compatible 5MHZ, 128K, Dual Disk Drives 12" Green screen as new $4995 (Terms Available). Phone 492-285 Bus: 668-512 Res: Box 9062 Auckland.

WANTED: a 16K RAM for a ZX81. Ph 557-683 Christchurch.

FOR SALE TRS80 Level 1, complete with manual, power supply, games, cassette. $400 ono. Geoff Jenkins, 10 Smith St. Waihi.

CASIO FX-801P OWNERS (or similar) who would like to exchange programs, ideas etc contact Darren Calkin, 5 Grey St, Kawakawa.

WANTED A high quality ZX81 16K Chess Program. Contact Jeremy Hollobon, 56 Armagh Street, Christchurch 1. Phone 64-329.

Commodore 16K RAM pack for use with Vic 20. Retail $249. Sell $200 ono. Phone 834-7300 Auckland

SHARP PC1500 USERS; Anyone interested in forming a user's group is invited to write to A. Thomas, P O Box 155, Napier. Easi-Calc 1500 spreadsheet program and Easi-File 1500 database program available. Write for details.

Overseas Student finishing computer science degree at Waikato University seeks full-time employment for 1-2 years only. Contact: Philip Lee, HOR, Teachers College, Hamilton. Telephone: 63-042.

ANIMATE: Cartoon graphic animator for TRS-80, System 80. Full edit, playback and save facilities with instructions, $18.00. Phone Wellington 286-786.

FOR SALE: System-80 parallel printer interface EG-3016 (Dick Smith Cat X-4013). As new, $50. ono. Chris Sullivan, 9 Galsworthy Place, Bucklands Beach, Auckland. Ph: 534-6510 evenings.

WANTED HP 82143A Thermal Printer (ie, not the HP-IL Printer). Write Simon Jones. 3 Pioneer Cres., Nelson. Ph: 85-459.

FOR SALE: Shugart 410 Disk drive 80 track, not used. $585. Telephone Selwyn Arrow 491-012 Auckland.

WANTED TO BUY: 9 Inch B and W Monitor. Metal case type. Phone WN 326-409 Collect.

BOOKS

From page 57

analog/digital and digital/analog conversion. Projects using this material go from turning on and off a single LED to making a burglar alarm to building a digital thermometer.

An early chapter advocates the use of a special "trainer board" for experimenting, but the text gives such clear explanations that this American product is not really necessary.

Only common chips are used in the project work and the circuits stay very simple.

This book is an ideal starting point for someone with an Apple computer who also enjoys tinkering with electronics. Although no knowledge of digital techniques is assumed, some previous electronics experience would be a big advantage, as specific constructional details (what sort of wire, how to solder, etc) are not included.

WANTED TO BUY: or swap software for System 80. Write Graeme Rose, RD2 Wellsford.

ZX81 Club: hints — tips — reviews — cheap games — books — accessories. NZSUG, 11 Miro St, Lower Hutt or phone Peter 662-410.

ZX81 games: personal copies of several ZX81 games. Write or phone Peter McCarroll, 11 Miro St, Lower Hutt phone 662-410.

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16-BIT

From page 34

Is this to say that cheap, 16-bit personal computing is some way away and in any case may not be worth waiting for? The answer is yes and no, but fundamentally that the current 16-bit business machines give little clue as to suitable non-business directions.

The main hindrances to the 16-bit advances reaching the home and school are unrelated to 16-bits as such. That hardware is there now and offers the opportunity to develop new uses. However, it is constrained by other considerations such as suitable software, suitable quality cheap graphics display devices and cheap and fast bulk store (will you really hand feed in 100 Apple or IBM floppy disks to fill your 16 megabytes of RAM?)

On going growth based on 16-bit computers will come but it will be part of an ensemble of related advances. Until those advances occur it will remain largely an unrealised dream.

There is another view, too. This says that the non-professional user doesn't really need 16-bit power. The market may split up into home machines (cheap, ubiquitous and 8-bit), and educational machines (networked, dearer and more robust with the slow arrival of 16-bit processors).

Maybe the general purpose computer will just disappear to be replaced by hard-wired, function-specific machines (the games-centre), the hand-held spreadsheeter, the word-processor. Is informal computing a nine-day wonder to be replaced by packaged applications machines? Maybe, but I suspect not that quickly. The 16-bit machine software to beguile the user will emerge and the megabyte home machine will appear in this decade . . just.

WANTED

Commercial software, and in particular New Zealand produced programs, to review.

Send your tape or disk to: **The Editor, BITS & BYTES, Box 827, Christchurch** and include:

Name of the program(s)
Hardware requirements
Name and address of New Zealand agent
Retail price

(software will be returned after being reviewed).

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